THE IRON TRADE REVIEW

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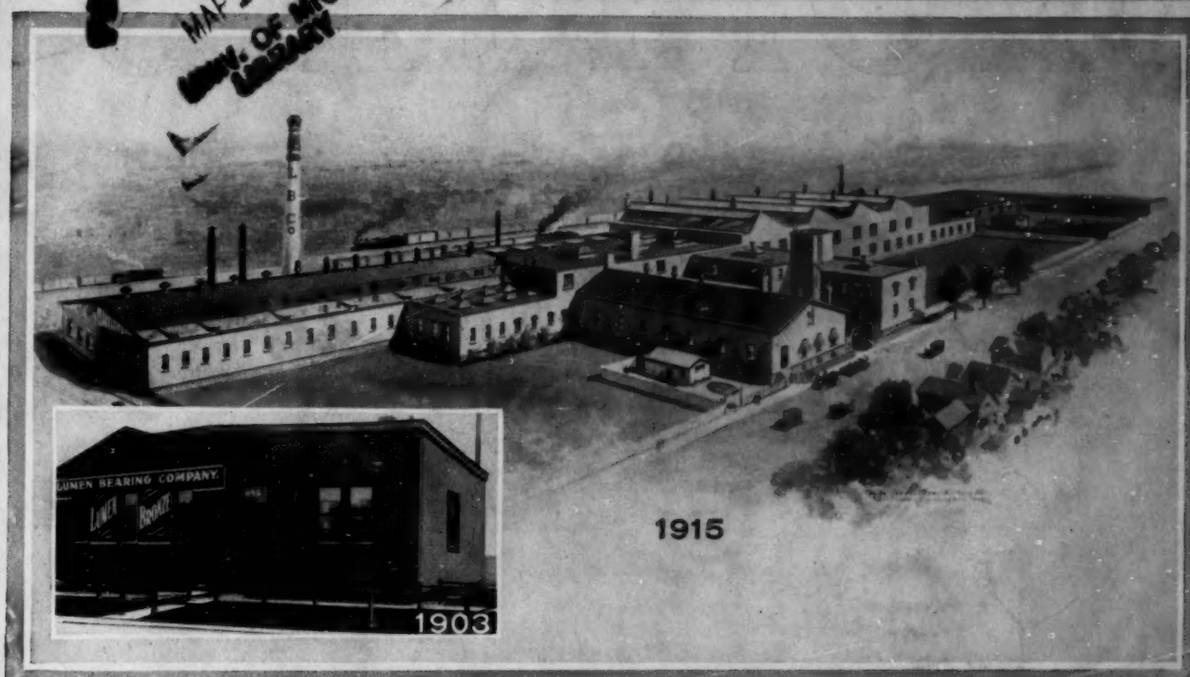

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KOPPERS

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THE IRON TRADE REVIEW

Vol. LVIII Cleveland, March 16, 1916 *No. 11*

Present Plant Capacity is Ample

To Meet Any Needs of the Government—Lack of Co-operation at Washington —Great Activity in Pig Iron and Finished Materials

THE tremendous increase in plant capacity for the manufacture of munitions and all sorts of equipment needed in warfare made by manufacturers in this country during the past year on account of the demand from Europe has placed the United States in the best condition in its history to meet any demands that may be made upon it in connection with the sending of a punitive expedition to Mexico or other eventualities. In entering into contracts with foreign governments, American manufacturers almost invariably have inserted a clause making it possible to revoke the contracts, if necessary, in order to manufacture munitions and other supplies for the American government. Manufacturers report that they could be ready on short notice to begin work for the United States. For some time past, however, officials at Washington have displayed reluctance to co-operate with manufacturers, and in order to bring about the best results, a change of policy of the national government would be necessary. It is not expected that the needs of the government will result in large orders in the near future.

Appropriations for enlargements which have just been made by the finance committee of the Steel Corporation include $1,500,000 for additions to the seamless tube capacity of the Shelby plant at Ellwood City, Pa., and other large work. A number of additional by-product coke ovens at the Clairton plant will be provided for in the near future. The Corporation has considerably over 1,000 new ovens now building or planned.

Pig Iron

Tremendous demand for pig iron prevails in nearly all parts of the country and prices are advancing. In the Buffalo district, inquiries represent a total of fully 75,000 tons, including 30,000 tons of bessemer and 25,000 tons of foundry grades. In Pittsburgh, one inquiry is for 30,000 tons of basic and another for from 15,000 to 20,000 tons of basic, and in the south, sales of the past week have amounted to from 40,000 to 50,000 tons of various grades. Heavy inquiry continues to come from foreign lands and a Pittsburgh company has sold 10,000 tons of bessemer for shipment to Italy.

Bars

New York manufacturers with foreign connections have inquired for 31,000 tons of rounds and billets for delivery as soon as possible. The inquiry is believed to be from Roumania. Another inquiry is for 50,000 tons of shell steel. The leading shellmaker who has practically closed a new contract for munitions with the British and Russian governments, as referred to last week, has taken no action on the 20,000 to 25,000 tons of steel required. This order is arousing much interest among machine tool manufacturers, as the company which will make the shells is negotiating for lathes.

Shapes

Structural lettings for February show an increase of 10,000 tons, compared with January. While some projects are being abandoned on account of the high prices, many awards are being made. Among those of the past week were 13,500 tons to the American Bridge Co. for the new Forest City House and other structures to be erected in Cleveland by the Terminal Properties Co.

Prices

The advancing of the price of plates to 2.60c, Pittsburgh, and of bars and shapes to 2.35c by the Carnegie Steel Co. represents a very conservative policy, as compared with prices which are being asked and in many cases obtained by leading independents. One western Pennsylvania manufacturer has established a minimum of 3.50c, Pittsburgh, on shapes, plates and bars. Leading platemakers are quoting 2.75c, Pittsburgh, for specific requirements, such as ship and car construction, to be delivered next year. Important buyers of plates are being quoted 3.75c, Pittsburgh, for fairly early shipment and contracts have been made at 3.60c, Pittsburgh, for September. The Carnegie Steel Co. has taken about 25,000 tons of car steel to cover orders for 1,500 cars for the Southern and 1,000 for the New York Central.

THE OPEN HEARTH

The Wicked Conspiracy at Youngstown—A Glance at Judge Gary's Labor Record

A WICKED, ambitious, notoriety-seeking prosecutor, or one who is willing to allow himself to become the tool of vicious agitators, can easily convert the present grand jury system into a weapon for the assassination of reputation and the besmirching of honorable records. This fact has frequently been demonstrated in past years when indictments have been found with shameless frequency against men who were not guilty of any crime and the latest examples have been furnished by the indictments of various companies and the Honorable E. H. Gary by the grand jury of Mahoning county.

Surprising as this action is to one who has not closely followed the course of events in Mahoning valley, it is the natural outcome of a prolonged agitation which has been carried on by certain union labor agitators with the determination to bring about the establishment of the closed shop in the valleys by any means in their power. These fellows, since the labor troubles which occurred in the Mahoning valley early in January, have received material assistance from the so-called committee on industrial relations, which, under the directions of the former chairman of the commission on industrial relations, has been publishing from Washington false and slanderous statements in regard to various companies and men at Youngstown. The youthful prosecutor allowed himself to be used to bring about the results so earnestly sought by the agitators at Youngstown and Washington. The indictment of the companies under the Ohio anti-trust law was, we believe, entirely without justification, as will be shown in due time, but the indictment of Judge Gary was even a greater offense against justice and decency. The man who in recent years has done more than any other man in the country to promote the welfare of labor is indicted and his name is reported along with other alleged offenders, including the following:

Louis N. Begala, second degree murder;
Joe Perry, manslaughter;
Ben Tucker, manslaughter;
Nick Koletich, second degree murder;
Norman E. Altman, bigamy;
Lindsey Crook, burglary;
Antonio Marten, burglary;
Jasper Thompson, robbery.

Could the mind of mortal man devise a plan more infamous to cover an honorable record with disgrace?

Who is this monster who is ranked with murderers, bigamists and burglars in public condemnation?

To follow his long career would be in part to describe the wonderful record of the United States Steel Corporation in humane and progressive treatment of its employes and we can only refer briefly to a few matters relating to workingmen which are directly connected with the position of Judge Gary, personally and officially.

For years, Judge Gary has been strongly opposed to Sunday labor and largely through his efforts it has been eliminated wherever it could possibly be done at Steel Corporation plants. When Sunday labor has been necessary, as in the case of the operation of blast furnaces, the plan of requiring that each man take one day off has been adopted. Judge Gary has also been strongly in favor of the elimination of the 12-hour day, and in 1911, a committee which he appointed expended about $25,000 in investigating to determine how the 12-hour day could be abolished and other improvements in the conditions of workingmen brought about. In the annual report of the Steel Corporation for 1912, Judge Gary said that the investigating committee had been unable to formulate any feasible plan for eliminating entirely the 12-hour day in those departments where operations were largely continuous, but so far as it was found possible to reduce the 12-hour turn, it had been done. At a luncheon of iron and steel manufacturers at the Metropolitan Club, March 29, 1911, in discussing prices, reasonable profits and wages, Judge Gary said:

"Do not forget that the laboring men have more at risk when these questions are considered than has the employer. *You have no right to run the risk of being compelled to put their wages below what they ought to be unless you are driven to it,* and I hope, under the present circumstances, gentlemen, that whatever may be done or whatever may happen as the result of present conditions, you will not reduce the wages of your employes until you feel it is an absolute necessity to do so."

In another period of depression, in the winter of 1913, in an address to the presidents of the subsidiary companies of the Corporation, he urged economy, but said that necessary expenditures should be made, and he added:

"Foremost under that head I would say that any money you can pay out to increase the safety of your employes is necessary and proper. Never hesitate to request appropriations for expenditure of money which is calculated to prevent accident to your employes. Keep that thought uppermost in your minds and

THE OPEN HEARTH

remember that any such request will be promptly approved."

Judge Gary urged the presidents to investigate as to whether there was distress among former employes who were out of work. "I trust the presidents themselves will take action," said this hard-hearted man, "to visit the places where these families live, to ascertain how they are coming along, and, if necessary to prevent suffering on their part, that you will be willing to contribute for the relief of these people." He also told the presidents to allow families who were unable to pay rent to remain in company houses free of charge, and that men be kept at work as much as possible.

In December, 1914, after many employers expressed fear that it would be absolutely necessary to reduce wages, Judge Gary announced that the Corporation would not make any reduction. This was only one of many times when the judge insisted that there should be no reduction of wages, at times taking this position in spite of the fact that many manufacturers had either reduced wages or had proposed to do so.

In the light of such a record, it is amazing that even labor agitators and misguided sociologists and politicians should single out Judge Gary as the one man in the country to be attacked for entering into a conspiracy to oppress working men. We are firmly of the opinion, however, that Judge Gary was right when, in an address before the American Iron and Steel Institute in Pittsburgh, in October, 1912, he said:

"The thought I would leave with you is that there is no way of settling any great question involving the welfare of humankind except on the basis of right and justice. Position, wealth, influence, laws, are helpless as a means of establishing a rule for human conduct unless supported by principles of justice and righteousness. The unfair, or unreasonable, or dishonest man, whether in public life or in private life, may succeed temporarily; but it is only a question of time when he will be discovered and overthrown."

The real conspiracy at Youngstown is one of labor agitators and politicians to accomplish their selfish purposes. We trust that the investigation by the Mahoning county courts will be so thorough that the real conspirators will be discovered and exposed and that the present grand jury system, which gives the accused no chance to be heard, will be radically changed, or that public sentiment will be so aroused that prosecuting attorneys will not dare to drag in the mire men of such high character as Judge Gary and companies which have carried on their business as honorably as have those which were indicted at Youngstown last week.

Russian Post Bellum Orders

THE huge undeveloped resources of Russia and the tremendous potentiality of that country as a market for all kinds of manufactured products never have been appreciated by American manufacturers so keenly as at present. Leading business men and bankers who have had occasion to become acquainted with the industrial possibilities of Russia, in fact, have gone so far of late as to class that country as the field most pregnant with promise for the development of the foreign demand for American products. That the requirements of Russia are huge and diversified, is indicated by the statements of the many American salesmen who have visited that country on business within recent months. The only obstacle, it appears, which prevents the immediate placing of an additional huge amount of Russian business, is the lack of ability on the part of a good many Russian buyers to finance their purchases. Practically all the Russian business which has been placed in this country during the past 18 months has consisted of war requirements, the payments for which have been arranged by the Russian government, as a result of credits which had been established in New York.

Now, however, a great deal of the business which might be obtained in that country is of a character which has nothing to do with the war and, hence, the government has no interest in facilitating such purchases by its citizens. Included in such business is equipment for iron and steel plants, agricultural implement plants, automobile plants and a great many other manufacturing establishments, which their owners would like to rehabilitate and modernize in order to take advantage of the flood of prosperity which is expected to develop in Russia upon the termination of the war. A representative of a large American machinery house who recently returned from Russia states that he was offered an order involving an approximate value of $1,250,000. Owing to the fact that the prospective buyer wanted to withhold payment until a year after the termination of the war, this order could not be taken, despite the fact that payment of the full amount, as well as interest on this sum, was guaranteed by a leading Russian banker. It is business of this character which American manufacturers should be enabled to take if they hope to develop an extensive market in Russia. Naturally, very few manufacturers would be able to accept business on such terms. The problem is to be solved only by financiers; it is to devise a method of floating adequately secured loans which would enable American manufacturers to secure business in Russia on the only terms which many responsible Russian buyers now are able to make.

Prices Present and Past

Quotations on leading products March 15, average for February, 1916, average for December, 1915, and average for March, 1915. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Mar. 15, 1916.	Aver. for Feb., 1916.	Average for Dec., 1915.	Aver. for Mar., 1915.
Bessemer pig iron, Pittsburgh	$21.95	$21.45	$19.85	$14.55
Basic pig iron, Pittsburgh	19.45	18.77	18.55	13.45
No. 2 Fdy. pig iron, Pittsburgh	19.45	19.51	18.85	13.80
Northern No. 2 Fdy., Chgo	18.50	18.50	18.10	13.00
Lake Superior Charcoal, Chgo	19.75	19.50	19.15	15.75
Mall. Bess., Chgo	19.50	19.00	18.10	13.00
Southern No. 2, Birmingham	15.50	15.25	14.13	9.38
Southern Ohio No. 2, Ironton	18.50	18.00	17.00	12.75
Basic, eastern Pa	20.00	19.50	18.00	14.00
No. 2X Virginia furnace	18.00	18.00	17.00	12.50
No. 2X foundry, Philadelphia	20.00	20.00	19.25	14.25
Ferro mang., Balti., (forward)	175.00	140.00	100.00	100.00
Bessemer billets, Pbgh	40.00	34.00	29.60	19.50
Bess. sheet bars, Pbgh	40.00	34.00	30.80	20.00
Op.-h'th sh. bars, Pbgh	40.00	35.00	30.80	20.00
Open-hearth billets, Pbgh	40.00	35.00	30.20	19.50
Steel bars, Chgo	3.10	2.23	1.97	1.34
Steel bars, Pittsburgh, contr	2.35	2.01	1.74	1.15
Iron bars, Philadelphia	2.559	2.409	1.959	1.15
Iron bars, Cleveland, local del'y.	2.40	2.29	1.75	1.15
Iron bars, Chgo. mill	$2.25	$1.91	$1.70	$1.10
Beams, Chgo.	3.10	2.22	1.97	1.34
Beams, Pittsburgh, contr	2.35	2.03	1.74	1.15
Beams, Philadelphia	2.659	2.259	1.959	1.25
Tank plates, Pbgh., contract	2.60	2.13	1.74	1.125
Tank plates, Chicago	3.50	2.33	1.97	1.34
Tank plates, Philadelphia	3.409c	2.709	1.959	1.25
Sheets, blk., No. 28, Pbgh	2.75	2.60	2.54	1.80
Sheets, blue an., No. 10, Pbgh.	2.90	2.61	2.23	1.30
Sh., galv., No. 28, Pbgh	5.00	4.75	4.25	3.40
Wire nails, Pittsburgh	2.40	2.22	2.02	1.60
Connellsville fur. coke, contr	3.00	2.50	2.35	1.65
Connellsville fdy. coke, contr	3.75	3.75	3.00	2.25
Heavy melting steel, Pbgh	18.25	17.37	17.40	12.00
Heavy melting steel, east'n Pa	17.00	16.50	16.00	11.00
Heavy melting steel, Chgo	16.50	15.25	15.40	9.75
No. 1 wrought eastern Pa	22.00	22.50	20.00	12.50
No. 1 wrought, Chgo	16.25	14.93	15.15	9.00
Rerolling rails, Chgo	17.75	17.12	16.70	10.00
Car wheels, Chgo	14.00	14.06	14.75	10.00

(For Additional Prices See Page 624.)

Heavier Inquiry for Pig Iron

Strong Demand for Steel Making Grades in the Pittsburgh District—Continued Activity in the East and Central West

Pittsburgh, March 14.—Several of the heaviest consumers of pig iron in western Pennsylvania have been sounding the market recently for steelmaking grades for shipment the second half of the year and it is likely that an active buying movement will be under way before the end of the first quarter. Some consumers say they would have closed negotiations for heavy tonnages a week ago, if they had been offered more attractive prices. Bessemer pig iron is being held at $21, valley, by most sellers and basic iron is firm at $18.50, valley. Foundry grades reflect strength, although no actual change in the position of prices is noted.

Belligerent European nations continue to place contracts for heavy tonnages of bessemer pig iron with valley blast furnace interests, one of which just sold 10,000 tons for shipment to Italy, at about $21, valley. The iron involved will be shipped either to Philadelphia or Baltimore. An Italian agent now is scouring the market for an additional lot of 10,000 tons of standard bessemer iron for prompt delivery. The French have opened negotiations for 200 tons of bessemer iron a day for shipment until the end of the war. It is, of course, impossible to estimate how much tonnage will be involved in this transaction.

The Union Switch & Signal Co. has entered the market for second half foundry iron requirements, involving approximately 3,500 tons. Scattering inquiries for foundry and malleable iron involve from 3,000 to 4,000 tons for shipment after July 1. Dealers are asking from $18.50 to $19, valley, for both grades; gray forge iron is firmly held at $18, valley. The Pittsburgh Iron & Steel Foundries continues to negotiate for 10,000 tons of bessemer iron and the Allegheny Steel Co. wants from 15,000 to 20,000 tons of basic iron for delivery the third and fourth quarters.

Strong Demand Continues

Cleveland, March 14.—Great activity in pig iron continues and prices are advancing. Cleveland agencies having furnaces at Buffalo and Toledo are quoting $19.50, Buffalo, on malleable and No. 2 foundry and $20, Toledo, on the same grades. One agency sold fully 25,000 tons during the second week in March and other sellers also report heavy business. An independent steel company which has been in the market for a round tonnage of bessemer has temporarily withdrawn. One seller quoted the company $20.50, valley, on 10,000 tons of bessemer, which has since been sold to another consumer. Among the inquiries pending, probably the largest is for 30,000 tons of basic from a Pittsburgh interest. In the immediate Cleveland district, while buying is not very active, the melt is being maintained and the demand for deliveries is insistent.

Pipe Makers Buy Heavily

Philadelphia, March 13.—Some heavy purchases of low grade iron by cast iron pipemakers have been of interest in a market of scattered trading. The two Lynchburg, Va., foundries have contracted for their last half needs of Nos. 3, 4 and forge, amounting to about 25,000 tons, from Virginia and Alabama makers at the regular Virginia schedule or about $18, delivered, for the grades taken. Eastern Pennsylvania pipemakers continue to make purchases of low silicon metal. A Philadelphia buyer closed for 1,800 tons of malleable for last half at about $21.50, delivered. The trade has heard reports of a sale of basic to a Trenton, N. J., consumer for first quarter of 1917 at a

(For complete prices see page 624.)

sharp advance over the last quarter, but these refer to the transaction at $21, delivered, or $20.75, furnace, covered in detail in last week's *Iron Trade Review*. The basic market is quiet. Makers of low phosphorus iron are selling sparingly for last half. Some of them are well sold up for that period, others are not inclined to sell so far ahead, as they are expecting considerably higher prices. One sale of 4,000 tons of Lebanon iron for last half was closed at well over $30, furnace. A late sale of standard eastern Pennsylvania iron for last half was at $31, furnace, and some further lots of another standard brand were placed the past week at $30, furnace. An eastern Pennsylvania consumer who has been reselling some of the iron it bought some time ago for current delivery, still is offering about 4,500 tons. The Eastern Steel Co. is about to start a furnace on low phosphorus. Canadian buyers still inquire freely for low phosphorus, one of them this week asking for 4,000 tons. A Philadelphia ship builder also is inquiring for 500 tons of bessemer for export. Foundry iron prices are holding well, but show little buoyancy. Some eastern Pennsylvania makers still ask $20, furnace, for No. 2X and $19.50 to $19.75 for No. 2 plain, but these figures are above the average market which is around $20, Philadelphia, for No. 2X. The Virginia market is unchanged at $18 to $18.25, furnace, for No. 2X.

Shipments Rushed

New York, March 14.—A much heavier inquiry for iron than this district has witnessed in some weeks, has appeared during the past few days. The new inquiry in this immediate territory and in New England has been not less than 30,000 to 40,000 tons, of which about 10,000 tons have been closed. A Chrome, N. J, steelmaker has purchased a large part of a 6,000 to 8,000-ton low phosphorus inquiry; a Connecticut shop is out for 3,000 to 6,000 tons of malleable; another buyer wants 3,000 to 4,000 tons of charcoal; in upper New England, a large consumer is negotiating for 5,000 tons of foundry iron and may buy 20,000 tons; another New England shop asks 2,000 tons of foundry; a New Jersey steelmaker wants 1,500 tons of bessemer. All this business is for shipment over the remainder of the year. A sale of about 1,000 tons of 3 per cent silicon Buffalo iron for last half was made at $20, furnace, and high silicon iron from that district has brought $21, furnace. Prices look stronger with $20, tidewater, as the average figure for No. 2X. The recent $18, Buffalo, quotations have disappeared and $18.50 is the minimum for No. 2X and malleable. A leading Lehigh valley maker has advanced No. 2X to $21, furnace, or $21.74, Jersey City. A rush of pig iron shipments to hard-pressed consumers in New England has followed another temporary lifting of the railroad embargoes. The New Haven has been accepting shipments for four days ending tonight at midnight; the Pennsylvania is receiving shipments from the Norfolk & Western, which is releasing iron from Virginia furnaces, and the Erie is lifting today against other lines. Practically all of Brooklyn remains under the ban. There are several new inquiries for export, one for 20,000 tons of bessemer and another for 3,000 to 5,000 tons of hematite, both for France.

Inquiry for 75,000 Tons

Buffalo, March 14.—With the furnaces of the district becoming sold up solid because of the heavy bookings of iron for steel purposes, there is every indication that the appearance of a demand for iron from the general run of foundries, with the arrival of the spring season, is almost certain to occasion a sharp advance in pig iron prices to a point that may reach or perhaps pass $25 per ton. Some producers are now quoting $20 as a minimum for such tonnages as may be available for delivery over the remainder of the year.

The turn of the week has developed an inquiry for fully 75,000 tons of the various grades, including 30,000 tons of bessemer iron, 25,000 tons of foundry grades, 6,000 tons of malleable and 5,000 tons of basic, and a number of smaller tonnage lots. One interest, it is stated, quoted $20 flat on the malleable inquiry, and it is further reported, has declined to negotiate even a slight shading of this price.

Melters who had previously advised the furnaces they were fully covered for their needs over the remainder of the year have completely exhausted before the end of the first quarter their entire first half allotments, and have commenced to urge upon the producers the prompt shipment of iron intended under their contracts for their last half needs.

The embargo of the railroads entering the New England section has retarded booking from that direction and the lifting of the embargoes for any considerable time, it is believed, would result in the furnaces being simply swamped with urgent orders. The users of all steelmaking grades are covered to a considerable extent, but the melters in the general foundry line, including the foundries engaged in the manufacture of railroad supplies and accessories, have not begun to buy in proportion to the way in which they are increasing their melts.

Many Small Sales

Youngstown, March 14.—The aggregate tonnage of pig iron sold during the past week was large. Orders for small tonnages constituted the bulk of the business, but the combined volume was good sized. Prices show stiffening tendencies. Bessemer is being held at $21. Basic is now being quoted at $18.50 to $19, while the $18.50 minimum on No. 2 foundry is disappearing. Gray forge is still held at $18 and malleable at $18.50 to $19.

Less Active But Firm

Cincinnati, March 14.—An Evansville, Ind., melter has purchased 7,500 tons of northern and southern foundry grades for last half delivery. Michigan manufacturers have taken 1,500 tons of charcoal iron, 1,000 tons of coke malleable, and 1,500 tons of silvery iron. The Louisville & Nashville railroad is inquiring for 900 tons of assorted grades to be shipped to its various shops. Southern Ohio furnaces are refusing business at anything below $19, Ironton basis, for No. 2 foundry, for shipment at any time this year. Speculators are holding a limited amount of resale iron from that district at from $18 to $18.50, Ironton basis. Southern Ohio silvery iron is unchanged at from $26 to $27, furnace, for 8 per cent silicon, but makers state that the minimum figure of $26 will disappear before the end of the week, and that quotations will be firm at $27. Southern No. 2 foundry iron is given at from $15 to $15.50, Birmingham basis, for the first half and from $15.50 to $16 for the second half. The market is not as active as it was last week, but it has lost none of its strength.

Chicago Malleable Higher

Chicago, March 14.—All makers of malleable iron in this district now are on a basis of $19.50, Chicago furnace, for any delivery this year. Action by one interest a week ago has been followed by others and the market is firm at that level.

Northern foundry has not shown equal strength and $18.50, furnace, represents the market fairly. A development of the near future is expected to be a differential on foundry irons containing moderate and high phosphorus, the former to be quoted

(*For complete prices see page* 624.)

at a higher level than the latter. This is following the tendency of the present market to specialize in the face of heavy demand and high prices.

Inquiry continues strong and sales large. Some interests find they have broken all records in volume of business and furnaces are finding a comfortable percentage of last half production already booked. In some instances half the iron for last half has been contracted.

Southern iron continues to show some weakness. With most makers asking $15.50 for first half and $15.50 to $16, Birmingham, for last half, sales at somewhat less have been made by some companies. Rumors of offers and sales at $15, Birmingham, have been rife and a quotation of $14.75, Birmingham, for No. 3 foundry, equivalent to $15.25 for No. 2, is known to have been made within a week, for last half delivery.

No change has been made in prices of charcoal iron. Considerable stocks of this grade are being held, though sales have been heavy. All charcoal stacks are operating full to provide by-products which are commanding large returns.

Large Tonnage Sold.

Birmingham, Ala., March 14.—There was practically no let-up in the buying of Alabama iron the past week. A total of 40,000 to 50,000 tons of iron was sold on basis of $15 per ton for some iron for first half, and $15.50 for last half delivery. The bulk of deliveries will be last half. Considering the fact that sales have been comparatively heavy for the past three weeks, sellers are now leaning more or less to the conservative side of selling, that is, limiting themselves as to the percentage of last half make to be placed on the market. One interest refused to accept an order for 6,000 tons of standard iron at $15.50 per ton for last half delivery, taking the position that it had practically sold its allotted tonnage under present conditions. This does not mean it is out of the market—but rather allotting tonnage among regular customers, and not large lots to any one. The Woodward Iron Co. is preparing to blow in its second furnace at Vanderbilt on foundry iron, and the Alabama Co. is seriously considering the blowing in of at least one of its Gadsden furnaces. If so, this will mean an additional 15,000 tons per month of foundry iron to be added to Alabama's production. There has been a decided improvement in the tone all 'round, and the feeling of unrest—which prevailed several weeks ago—seems to have banished from the minds of operators.

Ferro Now Quoted at $400

For Immediate Delivery—Domestic Spiegeleisen for Last Half Advanced $10 Per Ton and Freely Sold

New York, March 14.—No limit seems yet to prevail as to the height that the spot market on manganese alloys may attain. The higher movement still continues unchecked and where $350, seaboard, for 80 per cent ferro-manganese for immediate delivery was paid, a week ago, as stated in *The Iron Trade Review*, $400, seaboard, now is quoted by holders on carload lots. No sales of carload quantities at the new figure yet have been reported, but a few tons of lump ferro-manganese were sold at Pittsburgh on the basis of 20 cents per pound, or at $448, delivered, in that district. Domestic makers of ferro-manganese have advanced by $1 their prices for 50 per cent metal to $5, per unit of manganese or to a $400, furnace, equivalent for 80 per cent and are unable to make any deliveries at this figure for several months. Other domestic makers want at least $3.50, per unit, for low-grade manganese. Sales of lump ferro-manganese were made the past week at 15½ cents per pound, at the grinding plant, or at about $350, per gross ton.

Domestic spiegeleisen for last half has been advanced $10 a ton, to $60, at the furnace, for 20 per cent, and a good tonnage has been sold at the new price. Prior to this advance, there were sales for second quarter at $60, furnace, and for that period, $70, now is asked. For prompt 20 per cent, $100, furnace, has been quoted. Middlemen holding lots of 30 to 35 per cent spiegeleisen are asking $150, furnace, for this metal. The new Chicago maker of spiegeleisen and ferro-manganese now is actively booking orders.

It develops that, at least, 10,000 tons of English ferro-manganese, were sold on first-half contracts for 1917, at $175, seaboard, under the recent authorization given to agents in this country. It appears, however, that practically all this business went to one seller, as other makers have not been willing to take on additional business. Several thousand tons of offers by buyers of $175, for both last half of this year and first half of 1917, were put up to these makers the past week, but declined. There is no selling for forward delivery by any agent at present.

Prices Skyrocketing

Pittsburgh, March 14.—Buyers and sellers of 80 per cent ferro-manganese in western Pennsylvania are at sea to know the status of the situation for this material, the scarcity of which threatens to cause no little embarrassment. Domestic makers in the immediate district are not figuring in the open market, although domestic material has been offered at $5 a unit, or $400 a ton for 80 per cent material. Spiegeleisen has been advanced $10 a ton to $60, furnace, for delivery the second half of the year. This material also is scarce and further price advances are predicted by makers. Manufacturers of 50 per cent and lower grades of ferro-silicon have experienced tremendous demand the last few days; the bulk of the lower grades of this material available for delivery the second half of the year already has been sold. No definite prices prevail for steelmaking metals.

(*For complete prices see page* 624.)

Wire Mills

Are Selling Cautiously — Heavy Inquiry From Abroad

Pittsburgh, March 14.—Unprecedented demand continues to feature the market for wire products. Mills are selling very cautiously, most of them refusing to accept orders unless specifications are furnished at the time contracts are closed and all specified tonnage is being cancelled. Belligerent European nations are inquiring for heavy tonnages of barb wire and Canadian interests are asking bids on barb and plain wire and nails. More prominent mills are unable to promise deliveries in less than six months and some plants virtually are out of the market for the remainder of the year.

Nuts, Bolts and Rivets

Pittsburgh, March 14.—Manufacturers of steel rivets last Friday advanced prices $3 a ton to 3.15c for structural and 3.25c for boiler rivets for immediate acceptance. Further advances in the price of nuts and bolts are expected. Demand for all three products is declared to be heavy.

The Pittsburgh Valve, Foundry & Construction Co., Pittsburgh, has established an office in the Widener building, Philadelphia, of which Charles A. Anderson Jr., formerly assistant manager of the New York office, has been appointed resident manager.

Sheets for Auto Bodies

Aggregate Large Tonnage—Cleveland Buyer Not Able to Place Large Order for Last Half of Year

Youngstown, March 14.—Interesting changes have developed in the sheet market during the past week. Conditions, in many respects, are the reverse of previous ones as a heavy inquiry has developed for lighter gages while the demand for heavy stock is not as pressing. These heavier grades, however, are still in good demand, mills being offered more business than they will accept. But the inquiries that are appearing for light gage stock are for such large tonnages that this important branch of the sheet market, after being comparatively dormant for some months, now engages the greatest interest and attention. Automobile makers, in particular, are anxious to cover and in the case of the larger firms are seeking to close for a full year. One such inquiry involves more than 40,000 tons. This automobile business has been attracting quotations ranging from 3.85c to 4c. The uncertainty of sheet bar supplies during the last half and probably into 1917, has deterred some mills from considering business extending beyond four to six months' delivery. The roofing trade, also, bears an important relation to the strength exhibited by the light sheet market during the past few days. The decline of the galvanized roofing trade was the largest factor in weakening this market during recent months. With spelter prices forcing galvanized sheets to new figures, the roofing trade practically disappeared. Its apparent revivial now rests upon the necessity of replenishing depleted stocks. With galvanized prices still high, more attention is being paid to painted and composition roofing. The demand for painted roofing, particularly, has broadened considerably during the past few days.

Black sheets, No. 28, are being held at 2.75c to 2.85c, although some mills are asking higher prices. Some irregularities have developed, one mill disposing of 700 tons of light sheets on a 3.15c base. Blue annealed No. 10 is quoted at 2.90c to 3c and is firm.

Spelter's heavy decline during the week produced a modification of the maximum on galvanized sheets No. 28, and that grade now is quoted at 4.85c to 5.10c. The previous maximum was 5.25c. The car shortage continues to embarrass manufacturers, although some slight improvement was noticeable during the past few days.

Tonnage Goes Begging

Cleveland, March 14.—A Cleveland manufacturer of automobile bodies has been endeavoring to place a contract for 24,000 tons of blue annealed sheets for delivery at the rate of 4,000 tons per month over the last six months of the year, but has been able to obtain quotations on only 5,000 tons, as mills have expressed themselves as not interested at the price which the buyer was willing to pay. The most important feature of the market is the continued disarrangement of time-honored differentials. Demand for the heavier gages continues strong and Cleveland mills are selling No. 10 black at 3.45c, Pittsburgh, and No. 10 blue annealed at 3.50c. Relatively lower prices are quoted on the light gages.

Demand Unprecedented

Pittsburgh, March 14.—Unprecedented demand for all grades of steel sheets is reported by manufacturers in western Pennsylvania and eastern Ohio, who opened books for second half delivery about a week ago. Automobile, electrical equipment and agricultural implement makers have been conspicuous buyers, although most of them have been unable to purchase more than 50 per cent of their estimated requirements for the third and fourth quarters. Premium prices are being offered in a great many instances for delivery the last two months of the year. Despite contrary reports, sales books for shipment after Dec. 31, have not been opened. No. 28 gage black sheets are firm at from 2.75c to 2.85c; No. 10 gage blue annealed are quoted at from 2.90c to 3c and No. 28 gage galvanized sheets nominally are listed at a range from 4.90c to 5.25c. Considerable complaint about the shortage of sheet bars and the uncertainty of shipments is heard.

Differential is Varied

Philadelphia, March 13. Sheetmakers in the east are being put to some trouble to maintain the usual $5 a ton differential between No. 10 gage blue annealed and tank plates because of the rapid advance of the latter. There have been times recently when No. 10 gage sheets and plates have been quoted at the same figure. Eastern sheetmakers are not quoting freely, but they have taken orders for future delivery up to 3.50c, Pittsburgh, for No. 10 gage blue annealed with 3.25c as the usual quotation for third quarter.

Sheet Price Higher

Chicago, March 14.—Another unusual situation has presented itself in the relation of blue annealed and black sheets. Ordinarily No. 28 gage black sheets command 40c to 50c per 100 pounds more than No. 10 gage blue annealed. Under present circumstances No. 10 blue annealed are quoted at a minimum of 3.09c, Chicago mill, while No. 28 gage black are at a minimum of 3.04c, Chicago mill. Unless specifications are unusually attractive, buyers will find difficulty in placing their business except at a premium over these figures. Heavy demand is experienced from automobile and car builders for blue annealed sheets while demand for black sheets is not proportionately strong. Galvanized sheets remain nominally quotable at about 5.19c, Chicago mill, but trading is not active.

(*For complete prices see page* 624.)

Motor Trucks

Are Being Shipped to Mexico on Rush Orders for Government

New York, March 15. (By wire.)—Rush orders for 54 motor trucks for use in operations in Mexico were placed here by the government with the White Co., of Cleveland, and the Jeffery Co., of Kenosha, Wis. Some already are on the way to El Paso. Fifteen motor cycles and two wrecking wagons are also being ordered.

Cleveland, March 15.—Employes of the White Co. worked all of last night loading motor trucks and 28 were started today on their way to Mexico.

Strip Steel Advanced

Pittsburgh, March 14.—Cold rolled strip steel, actual sales indicate, now is selling at a range from 5.25c to 6c, or $5 a ton above the minimum price prevailing a week ago. One lot of 25 tons was sold at 6c several days ago. Sales books for shipment the second half of the year have not been opened, although consumers are more insistent about covering third and fourth quarter requirements.

Order for Lathes.—The Cincinnati Iron & Steel Co. has just received an order from Russia for a large number of simplex lathes for use in making 3-inch shells. The delivery is to be in April and May.

Shape Demand Very Heavy

Many Building Contracts Awarded—American Bridge Co. Books 13,500 Tons at Cleveland

Cleveland, March 14.—The American Bridge Co. has taken a contract for 13,500 tons of structural steel for buildings to be erected by the Terminal Properties Co., Cleveland, including the new Forest City House, which will require 4,500 tons, terminal buildings for the Cleveland & Pittsburgh railroad and an office building. It is expected that the tearing down of the old Forest City House will begin this summer. The American Bridge Co. has also taken a contract for the plant to be erected by the Owen Booth Bottle Co., Toledo, at Kanawha, W. Va., 2,100 tons. The Free Hotel Co. will erect a 12-story hotel on Prospect avenue, Cleveland, and has awarded the general contract to the Wells Bro. Co., Chicago. The hotel will have 600 rooms and will probably require 4,000 tons of steel. Inquiries for bridge material pending include 5,900 tons for the Chesapeake & Ohio, 2,000 for the C., B. & Q. and 900 for the B. & O.

Higher at Chicago

Chicago, March 14.—In common with other finished steel products, structural shapes have been advanced $2 per ton to 2.54c, Chicago mill. Bookings by fabricators during the past week in the west total about 4,500 tons, the largest item being 2,975 tons for the Central avenue viaduct, Kansas City, Kan., taken by the Missouri Valley Bridge & Iron Co.

Shape Demand is Heavy

Philadelphia, March 13.—Specifications from buyers of structural shapes with eastern Pennsylvania mills are extremely heavy and it is rarely that the full quotas of contracts are not taken out. Hence monthly cancellations are very light. Some of this steel undoubtedly is going into stock. The heavy demands under contracts are cutting down more and more the further tonnage that the mills can accept even for extended future delivery. A lot of 5,000 tons for third and fourth quarters from a buyer in the Cleveland district could not be accommodated, thought the latter was willing to pay very attractive prices. The Lenoir City, Tenn., car works was able to close 3,000 tons of shapes with an eastern mill for delivery by August, but $3 per ton more was paid than when this requirement came up for original quotation several weeks ago and then was withdrawn. Some of the important eastern makers are quoting 2.50c, Pittsburgh, or 2.659c, Philadelphia, as a minimum and for western shipment ask up to 3c, mill. Some tonnage still was available this week from other mills at 2.35c, Pittsburgh, but this was limited. An inquiry for about 1,500 tons of fabricated work for a number of storehouses in Japan has been withdrawn.

February Makes Good Showing

New York, March 14.—An increase of about 10,000 tons over the preceding month, was shown in the total of structural steel lettings in the country during the month of February, according to the statistics of the Bridge Builders' and Structural Society. These show that 75 per cent of the capacity of the bridge and structural shops of the country, or about 129,000 tons, was contracted for in February, as compared with 69 per cent, or about 119,000 tons, in January. The February showing was better than had been expected, since that month usually is a very quiet one in building work. The monthly statistics of the Bridge Builders' and Structural Society, showing the percentage of capacity contracted for and the approximate tonnage reported, are as follows:

Month.	Per cent.	Approx. tonnage.
February, 1916	75	129,000
January	69	119,000
December, 1915	121	208,000
November	105	180,000
October	78	135,000
September	67	115,000
August	85	146,000
July	86	148,000
June	80	138,000
May	61	105,000
April	62½	107,500
March	64	110,000
February	30	51,000
January	25	43,000
December, 1914	35	60,000
November	20	35,000
October	35	60,000
September	38½	65,000
August	27½	48,000
July	68	115,000
June	56½	95,000
May	57	97,000
April	88	151,000
March	76	130,000

In this city, a number of new building projects which largely were of the speculative class, have been abandoned, due, primarily, to the increased cost of construction which now has made it impossible to finance them. At past times, loans attainable upon such enterprises have covered the full cost of construction; today, such arrangements cannot be made and the builder is obliged to supply some of his own capital with the result that this class of building is discouraged. Several new steel contracts of importance have been placed in this district quietly and others are under figure, but the tonnage is below that of the several active weeks preceding. Plain material prices are higher and 2.50c, Pittsburgh, or 2.659c, New York, is the practical minimum. Small lots bring up to 3c, Pittsburgh, and from store 3.10c, now is quoted. It is interesting to note that some fabricators now are selling plain material in competition with the mills, as, with labor scarce, they are able to make more money in this way than on their regular product.

Structural Shapes Put Up $2

Pittsburgh, March 14.—The Carnegie Steel Co. on March 13, advanced its price of structural shapes $2 a ton to 2.35c; this figure represents an advance of $10 a ton since Jan. 1. On March 11, 1915, structural shapes were sold at 1.15c, or $24 a ton below the price enjoyed today. That further price advances will be made, appears certain. Fabricators are unable to promise deliveries in less than from six to eight months.

CONTRACTS AWARDED.

Central avenue viaduct, Kansas City, Kas., 2,975 tons, to Missouri Valley Bridge & Iron Co.

C. B. & Q. Ry. Co. girder spans, 750 tons, to King Bridge Co.

Great Northern Ry. Co., four turntables, 250 tons, to American Bridge Co.

Missouri Pacific Ry. Co., girder spans, 236 tons, to Pennsylvania Steel Co.

Indiana Steel Co., tie rods, buckstays, etc., for tilting furnaces in open hearth plant, Gary, Ind., 225 tons, to American Bridge Co.

New plant R. K. Le Blond Machine Tool Co., Cincinnati, 1,000 tons to the L. Scrieber & Sons Co., Cincinnati.

Bridge for the Baltimore & Ohio railroad, Defiance, O., 900 tons, to the American Bridge Co.

Addition to the store of Hutzler Bros., Baltimore, 600 tons, to the Chesapeake Iron Works.

Extension to the plant of the United States Metal Refining Co., Chrome, N. J., 600 tons, to an independent plant.

Cotton mill building, New Bedford, Mass., 1,000 tons, to the American Bridge Co.

Highway bridge over the barge canal at Little Falls, N. Y., 250 tons, to an independent shop.

Bridge for the Erie railroad near Niagara Falls, 190 tons, to an independent shop.

Rogers building, Niagara Falls, originally designed to require 650 tons of structural steel, concrete construction adopted.

Schiff apartment on Broadway above Ninety-fourth street, New York City, 650 tons, to the Empire Structural Steel Co.

Municipal building, Little Falls, N. Y., 200 tons, to the American Bridge Co.

Extension to Firestone Rubber Co. plant, Akron, O., 1,000 tons, to American Bridge Co., which recently furnished 1,500 tons for work for same company.

Forest City hotel, Cleveland, and other buildings of Terminal Properties Co., 13,500 tons, to American Bridge Co.

West Virginia plant of Owen Booth Bottle Co., Toledo, 2,100 tons, to American Bridge Co.

Open hearth steel plant for Donora Steel Co., Buffalo; 3,000 to 4,000 tons, to McClintic-Marshall Co.

Extension to plant of New York Ship Build-

(*For complete prices see page* 624.)

ing Co., Camden, N. J., 300 to 400 tons, to McClintic-Marshall Co.

Furniture Exchange building, Jamestown, N. Y., 1,500 tons structural, contract to Ferguson Steel & Iron Co., Buffalo.

CONTRACTS PENDING.

Pier for the City of New York at Forty-sixth street and Hudson river, 4,000 tons, Post & McCord low bidders on general contract and American Bridge Co. expected to furnish fabricated steel.

Building for the Edison Electric Co., Brooklyn, 500 to 1,000 tons, abandoned.

Astor apartment, Ninetieth street and Broadway, New York City, 1,000 tons or more, abandoned.

Building for the Merchants Refrigerating Co., Tenth avenue between Sixteenth and Seventeenth streets, New York City, abandoned.

Office building at Broadway and John streets, New York City, abandoned.

Building at Montgomery and Water streets, New York City, abandoned.

Sells Higher

Shell Steel for Last Half Brings Higher Prices in East

Philadelphia, March 13.—Higher prices are being quoted on large rounds for munition manufacture during the last half of the present year. An order for 10,000 tons of rounds for that period was placed by a domestic shell maker at 4.25c, mill. There was one quotation of 3.75c, mill, on this business, but it was withdrawn before being acted upon. Another tonnage of shell steel for export also was placed on about the 4.25c, mill, base, and some makers now hold that figure as a minimum. Some good-sized lots of steel for delivery during the last half are being negotiated for by munition makers. The steel bar situation is unchanged. There are frequent inquiries for last half contracts which makers are unwilling to quote upon. The contract figure of 2.25c, Pittsburgh, accordingly is largely nominal. Early shipments bring premiums. One large maker the past week adopted a flat price of 3.50c, Pittsburgh, on specific requirements for delivery at the convenience of the mill.

Steel Bars Advance

Chicago, March 14.—The leading interest made effective March 13 an increase of $2 per ton on steel bars, making the quotation for delivery at convenience of mill 2.54c, Chicago mill. Other bar makers have advanced to the same level, although most have nothing to sell at any price and the quotation actually means almost nothing.

Buyers who find an occasional opportunity to place a tonnage of bars are confronted by a heavy premium for anything like prompt delivery. As high as 3c has been done for bars needed for immediate use.

Hard steel bars rerolled from rails are still quoted at 2.25c to 2.35c, Chicago, but in view of the present advance in soft steel bars, it is believed the minimum quotation will disappear shortly and the market be firm on a basis of 2.35c.

Tonnage Limited

Cleveland, March 14.—The bar market continues exceedingly strong and while quotations range from 2.35c to 3.50c, Pittsburgh, the tonnage which can be bought at any price is limited. A few agricultural implement concerns which have not covered are becoming very anxious as to their ability to do so. The plan adopted by some mills is to allot agricultural implement manufacturers a certain monthly tonnage, to be paid for at the going rate of each month.

Bar Situation Strong

Pittsburgh, March 14. — Threatened trouble along the Mexican border, which already has lead to a punitive expedition, may develop an even greater demand for steel bars for the manufacture of war material. Despite the fact that most manufacturers now are operating plants at maximum capacity to meet the insistent demands of domestic consumers and entente nations, the United States would have little or no difficulty in obtaining war material, should this country become involved in hostilities of any kind. The patriotism of the steel and allied trades has been manifested in the past.

Steel bars on March 13, were advanced $2 a ton by the Carnegie Steel Co. to 2.35c, which figure now is being quoted as a minimum by all manufacturers. Generally, mills are refusing to sell for delivery beyond Dec. 31.

Iron Bars Strong

Chicago, March 14.—Bar iron continues to be quoted at 2.25c, Chicago mill, all makers adhering to this price. Business is being received in gratifying volume, but mills are careful not to obligate themselves on long contracts, as still higher prices seem likely to come out as time passes.

Hoops, Bands and Shafting

Pittsburgh, March 14.—Shafting makers are quoting as high as 20 off the list for carloads, although 25 off the list represents the general market. Bands have been put up $2 a ton to 2.35c and hoops are selling at as high as 2.75c for shipment during the second quarter.

(*For complete prices see page* 624.)

Cast Iron Pipe

Atlantic City Places Order — Other Cities in the Market

New York, March 14.—An order for 2,500 tons of 20 to 24-inch high pressure pipe for Atlantic City has gone to the United States Cast Iron Pipe & Foundry Co. J. B. Clow & Sons are low bidders on 450 tons of 6 to 12's for Syracuse, N. Y.; New Brunswick, N. J., has taken bids on 240 tons of 6 to 12's; a contractor's letting for the borough of Richmond, New York City, is up for March 20, calling for 550 tons of 6 to 20's and 20 tons of fittings. There is good private buying of pipe by the water and gas companies. Prices do not show any great variation and seem low relative to other metal products but keen competition on desirable business, especially on the larger sizes, holds back further advances. The railroad freight embargoes in the east remain a retarding influence in the market.

Cities Begin Buying

Chicago, March 14.—Considerably more activity is being manifested in inquiries for cast iron pipe on the part of cities which have not contracted for this season's requirements. Bids were opened March 15 at Cleveland for 4,500 tons, at Salt Lake City on the same day on 1,000 tons, at Jackson, Mich., March 16 on 1,200 tons, at Chisholm, Minn., March 20 on 125 tons and at Newcastle, Ind., March 20 on 100 tons.

All bids recently tendered at St. Louis on 7,200 tons of cast pipe, with alternate bids for steel, have been rejected.

Business Only Fair

Birmingham, Ala., March 14.—The buoyant feeling on the part of cast iron manufacturers which has characterized the situation the past few weeks was lacking last week. They report a fair business, with inquiries very good, but optimism is lacking. There has been no change in prices—and with the coming spring manufacturers express the belief that conditions will gradually improve. Following prices are quoted, per net ton f. o. b. cars at the plants, standard pipe: Four-inch to 6-inch, $28; 6-inch and up, $25; with $1 per ton extra for gas pipe and 16-foot lengths.

The Wm. Cramp & Sons Ship & Engine Building Co., Philadelphia, has advanced the wages of its workmen 10 per cent. About 5,000 men have been affected.

Phenomenal Plate Prices

Extraordinary Quotations Made by Large Independent Companies Do Not Stop Buying

Philadelphia, March 13.—Phenomenal prices are becoming more and more common in plates as the rapid advance goes on. An eastern Pennsylvania maker sold the plates for two marine boilers for shipment in 10 weeks at 5.25c, Pittsburgh. This maker now regularly is quoting at 4c, Pittsburgh, for delivery in eight to 10 weeks. A small sale for export was made at 5c, Pittsburgh. Two large eastern Pennsylvania mills now have fixed their minimum $5 a ton higher, at 3.50c, Pittsburgh, or 3.659c, Philadelphia, and in some cases ask 3.75c, Pittsburgh. Their deliveries are not under six months. A large western Pennsylvania works has adopted a flat 3.50c, Pittsburgh price, at which it is able to make comparatively early shipments. A large Pittsburgh maker is understood to have adopted a new schedule of 2.75c to 3c, Pittsburgh, for specific ship and car requirements in 1917, this being an advance of about $5 a ton. It is apparent that the minimum eastern price on plates at present is 3.25c, Pittsburgh, or 3.409c, Philadelphia, and this is disappearing. Makers are entering all the tonnage they can handle and are obliged to reject much business. One eastern maker reports that at present it is accepting one ton of new business to six declined. The Pennsylvania Ship Building Co. has closed with an eastern Pennsylvania mill for 10,400 tons of plates for six boats to be shipped over 18 months, beginning in several months. The Lenoir City, Tenn., car works is understood to have closed for a considerable plate tonnage.

Plates Put Up $5 a Ton

Pittsburgh, March 14. — Steel plates continue their sensational march toward higher price levels and the top of the market is not yet in sight. On March 13, the Carnegie Steel Co. advanced prices $5 a ton to a minimum of 2.60c for shipment at the convenience of the mill. Some material for extended delivery has been sold at 2.75c. A year ago, plates freely were offered at 1.15c, or $29 a ton below the price prevailing today. Since Jan. 1, of this year, plates have advanced $15 a ton for future delivery. Car and ship builders are besieging mills for additional tonnages and decidedly high prices are being offered for nearby shipment. More important mills have scarcely any more material to offer for shipment this year.

Prices Very High

Cleveland, March 14.—Prices are very high, and although the Carnegie Steel Co. quotes 2.60c, Pittsburgh, Cleveland mills have no difficulty in selling at 3.25c to 3.50c for delivery in from three to 10 weeks. Some sales have been made by an eastern company at 3.60c for September delivery. All plate companies are exceedingly conservative about taking on new business.

Plates Advance Rapidly

Chicago, March 14.—Announcement was made March 13 of an advance effective immediately which places the price of steel plates at 2.79c, Chicago mill. This action by the leading interest carries the quotation by independents to the same figure, but as few plates are available, the price may be considered nominal.

Makers who can furnish tonnages of plates obtain considerable premiums and the actual market may be quoted at 3.44c to 3.94c, delivered, Chicago. A quotation recently was made on an inquiry for April delivery of plates at 4.19c, Chicago, with a provision that one-quarter the purchase price must accompany the order in cash. A sale of plates recently was made for delivery during fourth quarter at 3.19c, Chicago.

Tin Plate Prices High

Pittsburgh, March 14. — The strength of the market for tin plate is reflected by the sale of a decidedly heavy tonnage for export to the far east at a price equivalent to $4.35 base, Pittsburgh. Manufacturers having material in stock say they would refuse to shade $4.50 base, although no trace of sales at that figure is found. Mills literally are swamped with specifications against contracts placed several months ago, when tin plate was selling at $3.60 base, the price named Nov. 11, 1915, for shipment during the 1916 season. Tin plate manufacturers are beset with numerous difficulties, owing to the high price and scarcity of semi-finished material.

New Electric Furnaces. — Several new additions to the list have brought the number of Heroult electric steel-making furnaces in operation or under license in the United States to a total of 53. The Alabama Power Co., Anniston, Ala., has purchased two 6-ton units, which are in addition to one 6-ton furnace now in operation. The Lebanon Steel Foundry Co., Lebanon, Pa., is adding a 2-ton furnace to a 1-ton furnace, which previously was in use. The Vulcan Crucible Steel Co., Pittsburgh, has purchased a 3-ton furnace.

(For complete prices see page 624.)

Coke Stronger

Blast Furnace Operators Show More Interest in Market

Pittsburgh, March 14.—Blast furnace managers throughout the country manifest greater interest in the market for delivery the second half of the year. Several round tonnages have been sold for that shipment at $3, ovens, although some dealers are refusing to shade $3.25, ovens, for delivery the third and fourth quarters. Consumers of 72-hour coke, with few exceptions, have covered requirements for the year beginning July 1, next. More prominent cokemakers are quoting $3.50 for 12 months' delivery and $3.75 for six months' delivery, beginning July 1, next. The market for prompt furnace and foundry coke shows no change in position, although prices appear to be more firmly maintained. The *Connellsville Courier* for the week ending March 4 says production of coke in the upper and lower Connellsville regions was 444,342 tons, a decrease of 808 tons, compared with the week previous.

Foundry Coke Active

Cincinnati, March 14.—Buying of foundry coke on contract continues active for deliveries beginning July 1. Nothing of importance is pending for contract furnace coke in this district at present, but a good demand is out for spot 48-hour coke, which is very scarce. Prices in all southern fields are very firm. Wise county contract foundry coke is quoted at from $3.50 to $3.75, ovens; Pocahontas contract foundry coke at from $3.25 to $3.75, ovens, and New River contract foundry at from $3.75 to $4.25, ovens.

Ralph J. Moore, formerly affiliated with the Ferro Machine & Foundry Co., Cleveland, has been appointed production superintendent of the Pratt & Cady Co., Hartford, Conn.

The Dravo Contracting Co. has purchased a tract of seven acres on Neville Island, Pittsburgh. The site adjoins the property of the company.

Billet Prices

Are Still Very High—Offering Ingot Crops in the East

Philadelphia, March 14.—Considerable offering of short lengths of open hearth ingots, blooms and ingots is to be observed in this district, this coming from producers who are making steel for munitions and under the specifications of foreign governments are obliged to take a 25 per cent crop. Rather than sell this first-class steel as scrap, they are marketing it for rerolling or forging, and it is helping out some consumers in the present stringency of supplies in semi-finished steel. These crops are bringing much more than scrap prices. A Buffalo maker is offering 6,000 to 8,000 tons monthly of open hearth billets and slabs for rerolling and is marketing considerable of this output in this territory at from $40 to $45, mill, or from about $42.50 to $47.50, delivered. One western Pennsylvania mill is asking $75, Pittsburgh for forging billets, but eastern Pennsylvania makers quote $65 mill for this quality and $50 to $55 for open hearth rerolling billets for third quarter. One eastern maker received this week from a regular consumer an offer of $70, mill, for rerolling steel of special quality, but declined the business.

Billets Held at $40

Pittsburgh, March 14. — Bessemer and open hearth steel billets have been advanced $2 a ton to a minimum of $40, mill, by sellers in Pittsburgh. Sheet bars are held at a range from $40 to $42. Demand for semi-finished steel products for shipment the second quarter of the year is heavy. Manufacturers say consumers will pay current prices for April, May and June requirements. Wire rods, nominally quoted at a range from $50 to $60, Pittsburgh, are scarce, and doubt is expressed whether material could be obtained at the minimum figure. Muck bar nominally is quoted at $40, Pittsburgh.

Strong at Youngstown

Youngstown, March 14.—The semi-finished steel situation is receiving more attention from both producers and consumers in the valleys, particularly in reference to third quarter requirements. Steel producers, as a general rule, have not been disposed to accept contracts for that period, although one contract has been practically closed at less than $40 for third quarter delivery. Some consuming mills which a few weeks ago were unwilling to believe that the market was firm at about $40, are now uncertain whether they can cover at that figure. Bessemer grades in both billets and sheet bars are quoted at $40, but the tonnage moving is small owing to the sold-up condition of the mills. For open hearth stock, the few sales made are determined almost entirely by the necessities of the customer. The producers, with little to sell, are receiving attractive quotations from hard-pressed consumers, but little of this business is being taken. One customer today offered $55 for open hearth billets, not of special analysis, but the business was refused. Quotations for open hearth stock are therefore largely nominal. While some action is expected within a few weeks on covering sheet mill requirements for the third quarter, few producers are disposed to consider last quarter business.

Pipe Prices

Are Again Advanced—Standard Black is Up $2 to $4

Pittsburgh, March 15. — The National Tube Co., under date of March 14, distributed cards showing an advance of one point, or $2 on all sizes of standard black pipe, except 2-inch lap weld, which was put up two points, or $4 a ton. Standard galvanized pipe was advanced irregularly from $4 to $10 a ton; smaller sizes were advanced three, four and five points, while the larger sizes were put up two points. Oil country goods were advanced proportionately. Steel boiler tubes were advanced two points, or $4 a ton. The last previous advance in standard steel pipe and boiler tubes was announced Feb. 29. Since Jan. 1, 1916, standard steel pipe has been put up from $8 to $12 a ton. Manufacturers of wrought iron pipe are sending out revised cards showing advances ranging from $2 to $10 a ton, changes being similar to those made by manufacturers of wrought steel pipe.

German Pig Iron Production

The German pig iron production reached in December, 1915, with 31 work days, 1,029,144 metric tons against 1,079,122 metric tons in November with 30 work days. The average daily output reached in December 33,198 metric tons compared with 33,971 metric tons in November, 1915, and with 27,554 metric tons in December, 1914.

The output in the last few years was as follows:

	Metric tons.
1907	13,041,000
1908	11,808,000
1909	12,902,000
1910	14,792,000
1911	15,528,000
1912	17,821,000
1913	19,300,000
1914	14,390,000
1915	11,867,000

(For complete prices see page 624.)

Warehouse Prices

Are Advanced at Cleveland, Cincinnati and Pittsburgh

Cleveland, March 14. — Cleveland warehouses have advanced their prices $5 a ton on bars, shapes and blue annealed sheets and $10 a ton on plates. Quotations are now as follows: Steel squares, 2 inches and over, 3.75c; steel rounds, 2 inches and over, 3.75c; steel bars, under 2 inches, 3.25c; iron bars, 3.20c; shapes, 3.25c; plates, 3.65c; No. 10 blue annealed sheets, 3.50c. The quotations on No. 28 black and No. 28 galvanized sheets are unchanged at 2.95c and 5.25c, respectively.

Plates from Store Up $7

Chicago, March 14.—Chicago warehouses today made effective at once an increase of $4 per ton on bars and small shapes and $7 per ton on plates from store. This follows the sudden advance of mill prices Monday, although it is not exactly parallel.

The advance brings bars and shapes to 3.10c, Chicago, and plates to 3.50c, Chicago. St. Louis and St. Paul prices from store are 0.05c and 0.10c higher, respectively.

Cincinnati Prices Strong

Cincinnati, March 14. — Warehouse prices remain strong and slight advances are being realized each week. Cold rolled round bars are now quoted at list price, in comparison with 5 per cent off last week, and flat, square and hexagon, which were quoted at list price last week, are now given at 2 per cent plus the list price. Hot rolled bars are unchanged at from 3c to 3.50c. Warehouse prices on sheets are as follows: No. 10 blue annealed, 3.25c to 3.50c; No. 28 black, 3.65c; and No. 28 galvanized, 5.30c.

Advances at Pittsburgh

Pittsburgh, March 14.—Pittsburgh warehouses have advanced prices of plates, shapes and bars irregularly from $2 to $5 a ton to the following basis: Shapes, 3.10c; plates, 3.50c; flats, rounds and squares, under 2 inches in diameter, 3.20c; rounds and squares, 2 inches and over, 3.75c; ¼-inch reinforced bars, 3.25c. This advance closely followed that affecting mill products announced under date of March 13, by the Carnegie Steel Co.

The fan house at No. 4 mine of the Stineman Coal & Coke Co., at South Fork, Pa., was damaged by fire recently.

Heavy Buying of Scrap

By the United States Steel Corporation Has Stimulated Market—General Movement is Expected

Pittsburgh, March 14.—Heavy buying of steel scrap by the United States Steel Corporation, which took no less than 125,000 tons of heavy melting material for shipment to mills in the Chicago, Youngstown and Pittsburg district, has tended to strengthen prices considerably. Dealers have paid as high as $18.60, delivered, for melting steel and the market easily is quotable at a range from $18.25 to $18.50, delivered. None of the larger independent mills have figured in the market recently, but indications are that a general buying movement will feature the market at an early date. No railroad embargoes against the shipment of scrap exist in this district.

Stronger Conditions

Philadelphia, March 13.—A more buoyant influence is being imparted to the eastern Pennsylvania old material market as the result of the heavier buying of heavy melting steel and other grades at advanced prices in the Pittsburgh district. Material from neutral points now is being attracted to the Pittsburgh market, where $18.25, delivered, for heavy melting steel freely is being offered by brokers and dealers. The result is a shortened supply in the eastern Pennsylvania district and stronger prices. Brokers are bidding $17, delivered eastern Pennsylvania, for steel and it is understood $17.50, delivered, has been offered by consumers for tonnages.

Prices Advance

Cincinnati, March, 14.—The iron and steel scrap market is much stronger. Buying by rolling mills is much more active and jobbing foundries are also coming into the market for better lots than for any time since the first of the year. An advance of 25 cents per ton has occurred on practically all grades of scrap iron carried by local dealers. Heavy melting steel is especially strong, and is quoted at from $14 to $14.50 per gross ton.

Scrap Continues Strong

Chicago, March 14. — Continued strength manifests itself in the iron and steel scrap market, with considerable buying of heavy melting steel and some advances in quotations. The leading interest is believed to be taking tonnage steadily and as nearly as the market can be gaged heavy melting steel rules at $16.50 to $17. Some other items are also slightly above last week's quotations.

Stiffening of Prices

Buffalo, March 14.—Large sales of heavy melting steel continue to lead a market that is becoming stronger in demand and general activity. This has resulted in a further stiffening in prices in heavy melting steel, railroad malleable, stove plate, bundled sheet scrap, wrought pipe and No. 2 bushheling scrap.

Hunting For Material

Birmingham, Ala., March 14.—There has been no change in conditions affecting the old material market in the Birmingham district. Dealers are very active in their search for old material at present prices, being content to augment their stocks, believing that the next few weeks will put quite a new aspect on the low-priced pig iron situation. On this point hinges the hope of a rise in scrap prices.

Heavy Rail Buying

Follows the Opening of Books For First Half of Next Year

New York, March 14.—Heavy sales of steel rails for delivery in 1917, have been made following the general action of makers during the past week in opening their books for the first half of next year. Some scattered orders had been placed for next year prior to this action of the mills, as previously reported, but now general selling is under way and the next several weeks promise to see a large portion of the requirements to July 1, 1917, under contract.

Among the principal sales made for next year the past week are 50,000 tons to the Tennessee Coal, Iron & Railroad Co. for the Frisco; 40,000 tons to the Illinois Steel Co., 6,500 tons to the Lackawanna Steel Co. and 5,000 tons to the Pennsylvania and Bethlehem Steel companies for the St. Paul; about 15,000 tons to the Pennsylvania, Bethlehem and Lackawanna Steel companies for the Delaware, Lackawanna & Western. Another western system has placed 15,000 tons with Steel Corporation mills and there have been other sales. The Louisville & Nashville took 45,000 to 50,000 tons for the Tennessee Coal, Iron & Railroad Co., this sale being previously covered by reports though not in detail. Neither the Pennsylvania nor the New York Central systems yet are out for next year needs. There is considerable rail tonnage in the market for shipment during the last quarter of the year, which the roads are having trouble to place.

The car market continues active with a heavy inquiry. Sales of the week include:

The Southern railway, 1,000 gondolas to the Pressed Steel Car Co. and 500 gondolas to the Mt. Vernon Car Mfg. Co.

New York Central lines, 1,000 box cars for the New York, Chicago & St. Louis to the American Car & Foundry Co.

Atlantic Coast line, 500 box cars and 300 flat cars to the Barney & Smith Car Co.

Great Northern, 500 refrigerators, to the Haskell & Barker Car Mfg. Co.

New car inquiries include the following:

New York Central, 500 to 1,000 hoppers and 500 to 1,000 gondolas.

Italian State railways, 2,000 gondolas and 2,000 box.

Consolidation Coal Co., 1,000 hopper, inquiry revived.

In locomotives, the Baldwin Locomotive Works has 50 for the Burlington and the American Locomotive Co. two for the Bethlehem Steel Co. and one each for the Aluminum Co. of America and Denver & Sale Lake railway.

Track Material

Pittsburgh, March 14.—Most manufacturers of railroad spikes now are refusing to shade 2.65c for standard sizes, although the 2.50c price has not disappeared. Track bolts are firmly held at 3.25c and angle bars are commanding as high as 1.75c.

Buying 1917 Rails

Chicago, March 14.—Selling of rails for 1917 delivery is being done generally, although in previous years books for the succeeding year usually have not been opened until July 1. The present activity is almost unparalleled, but railroads are anxious to protect their requirements for next year and some tonnages already have been booked. It is understood the Illinois Steel Co. has taken 40,000 tons of rails for the Chicago, Milwaukee & St. Paul railroad, in addition to a small tonnage placed with an eastern company for quicker delivery.

The Burlington and Sante Fe roads are inquiring for comfortable tonnages for next year's delivery.

The strike at the plant of the Verona Steel Casting Co., Verona, Pa., was settled March 10, when strikers accepted slight advances in wages.

(For complete prices see page 624.)

Large Outlay

Will be Made in Making Additions to Donner Steel Co. Plant

Buffalo, March 15.—Plants involving an expenditure of $5,000,000 on the Donner Steel Co.'s plant at Abbott road and the Buffalo river, and an ultimate outlay in two years of $8,000,000 are now under way.

Only billets are now made at the plant. These have been turned out at the rate of 6,000 to 8,000 tons a month. The plant will be enlarged by constructing two additional blast furnaces, two rolling mills, coke ovens, a large ore dock and ore handling machinery of the most modern type. It has not been decided definitely what character of finished product will be turned out when the steel mill extensions are added. It will furnish employment to about 2,000 men and will have three furnaces as compared with seven at the Lackawanna Steel plant.

The plant has a frontage of about 1,000 feet on the Buffalo river near Abbott road, and though the river had not been improved up to the plant when it was operated by the New York State Steel Co., the improvements have now been carried to a point beyond and the Lackawanna railroad has built a bascule bridge so that ships of large draught may pass. Large ships may reach the Donner plant with ore and may be loaded with finished product for shipment west. Among the contemplated plans is the construction of a large ore dock to be finished by next September.

Wage Advances

For Men Employed in Sheet, Tin Plate and Bar Iron Mills

Men employed in sheet, tin plate and bar iron mills controlled by the Amalgamated Association of Iron, Steel and Tin Workers will benefit as a result of the bi-monthly examination of sales sheets of selected mills, conducted at Youngstown, March 11. The average price of bar iron during January and February was 1.40c, or $2 above the price developed at the last previous examination, entitling puddlers to $6.60 a ton for boiling, an increase of 40 cents a ton.

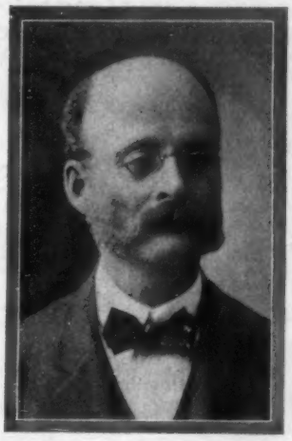
The selling price of steel sheets was slightly above 2.25c, base, the examination indicated, restoring to sheet mill men the wage scale adopted July 1, 1914; on March 27, 1915, the 1914 scale was reduced about 11 per cent, after members of the association accepted a wage readjustment at a referendum.

The average price of tin plate during the first two months of this year was $3.35, base, or 15 cents above the minimum named in the revised wage schedule adopted March 27, last, when wages of tin mill men were cut about 6 per cent. Fifty per cent of the reduction will be restored as a result of the average price developed March 11.

While sheet and tin plate mill men were not entitled to an advance in wages through sales averages developed in January, yet most manufacturers voluntarily put up wages from 3 to 5 per cent shortly after Jan. 1.

Passing of "Uncle Barker" a Dearly Beloved Man

Melville Hazen Barker, general manager of the American Tool & Machine Co., Boston, died at his home in Dorchester, Mass., on March 9. Mr. Barker was born in Bridgton, Me., 70 years ago. He received his education at the University of Wisconsin. In 1874, he became connected with the American Tool & Machine Co. as mechanical engineer, and in 1894 became general manager. Mr. Barker was a charter member of the National Metal Trades Association, and was its president in 1907. He was a member of the Massachusetts Charitable Mechanics' Association, Boston City Club, Boston Engineers' Club, Boston Art Club, Engineers' Club of New York, Machinery Club of New York, and was affiliated with a great many other clubs and orders. His death followed a four-days' illness with pneumonia.



MELVILLE HAZEN BARKER

Walter D. Sayle, president of the Cleveland Punch & Shear Works Co., and former president of the National Metal Trades Association, pays this tribute:

"I have known Mr. M. H. Barker intimately for over 15 years, and was active with him in the affairs of the National Metal Trades Association during most of the time.

"'Uncle Barker', as he was lovingly known, leaves a host of friends all over the country, and I cannot see how anyone who has ever come in contact with him could be other than a friend, as he was a real man of sterling character and true as steel.

"On account of his wise counsel, he was repeatedly elected a member to the administrative council of the association, and after he had served as president (1907-8) he was honored by being named the only honorary member, which honor was continued until his death.

"The death of Mr. Barker leaves vacant a position which never can be successfully filled, and the members of the National Metal Trades Association lose a true friend and a conscientious co-worker."

Advances $10

New York, March 14.—A leading eastern Pennsylvania structural shape maker late today advanced his prices $10 a ton or from 2.50c, Pittsburgh, to a minimum of 3c, Pittsburgh. Less than a week ago this producer advanced from 2.25c to 2.50c, Pittsburgh.

Erasmus D. Leavitt, mechanical engineer and designer of the Calumet & Hecla plant at Calumet, Mich., died at Cambridge, Mass., aged 81 years.

Ready to Go to Work for Uncle Sam

Manufacturers Prepared to Serve Their Country

But Policy of Government at Washington Must be Changed—Clauses in Contracts With Foreign Governments Provide for Cancellation in Case United States Appears as Buyer

New York, March 14.—The United States, on the eve of its invasion of Mexico, finds itself in a better condition than ever before in its history, as far as the ability to manufacture war munitions is concerned. Talks with the heads of some of the large companies which are engaged on an extensive scale in the manufacture of munitions for foreign governments, indicate that the shifting of these plants from foreign to domestic requirements would prove a simple process, since all the munition contracts, as far as known, embody some clause which would permit of cancellation in the event that United States finds itself in need of war supplies. In most cases, the contracts embody a provision whereby the enforcement of an embargo prohibiting further exports of war munitions would result in no loss to manufacturers, the foreign governments having agreed, in such a case, to remunerate the manufacturer here for all expenditures made for raw materials or in making any other preparations for the fulfillment of such contracts.

That companies now engaged in the manufacture of arms in this country will show no hesitancy in placing their entire capacity at the disposal of the government, is indicated clearly by the announcements of such concerns as the Midvale Steel & Ordnance Co., the Remington Arms Co. and the Eddystone Ammunition Corporation, the Baldwin Locomotive Works, Bridgeport Projectile Co. and others. In fact, several of these companies announce that they are making every effort to rush deliveries on contracts recently placed quietly by the government. The Remington Arms Co. at Eddystone, Pa., for instance, now is engaged on a contract for 2,000,000 rifles for the army while the Eddystone Ammunition Corporation has commenced work on the manufacture of 2,500,000 shells for the United States Army. The Baldwin Locomotive Works has an order for 17,000,000 shell forgings, and the Midvale company also has large orders for war munitions for the United States army. All of these companies have announced their willingness to throw aside all of their other work, if necessary, in order to hasten the output of such material. It is understood the Crucible Steel Co. of America, the Bethlehem Steel Co. and the American Locomotive Co., also have received large orders of late for war munitions for the government.

Present indications are that there will be absolutely no difficulty in securing small arms, ammunition, bayonets, uniforms and other military supplies of this character in any quantity, however large the requirements may be, owing to the enormous scale on which machinery for manufacturing such supplies has been installed in plants throughout the east and middle west. The maximum possible output of military rifles could not be reached prior to the expiration of several months, owing to the lack of the large number of gages to be required. It is known, however, that the government has accumulated several million Springfield rifles so that any delay required for making gages would not be keenly felt. A serious handicap, however, is reflected in the shortage of 3 and 4-inch guns and in the lack of facilities for manufacturing such armament. The head of a large company making 3-inch and larger shells for several of the belligerent nations, commenting on this angle of the situation, states that while an unlimited supply of ammunition of this diameter may be had in this country, there are practically no guns to shoot it and furthermore, very few plants are equipped to make such guns. In this connection, it is interesting to note that efforts which have been made by a number of concerns lately to secure information from the government, relative to the character of equipment necessary for the production of such guns, have elicited only a courteous refusal of the war department to co-operate in this matter. The government's attitude in this connection apparently is actuated by a fear that plans and specifications placed in the hands of manufacturers might, in some indirect way, become the property of foreign countries. At any rate, the effect has been to discourage a number of manufacturers. One large interest, for instance, last fall declared its willingness to spend several hundred thousand dollars in laying in jigs, gages, fixtures and other apparatus for making 3-inch guns, but its request to the government for the necessary information was refused, with the result that no further action was taken.

Eager to Respond to Government's Call

Philadelphia, March 14.—Steel and ammunition makers in this and surrounding territory stand ready to furnish the United States government to the last pound or shell, all the war material that may be required in the present punitive excursion into Mexico, no matter how far-reaching the enterprise finally may become. And they will perform freely this service to the government, in full accordance with every necessity as to the promptness of delivery and quantity of product, as shall be presented, notwithstanding the fact that the industry now is completely swamped with demand and is in the midst of executing large contracts for steel or shells for the European war. In other words, the steel and munition makers await the call to put aside all other considerations and private obligations and to work solely or in part for the government.

This is the general statement that is to be gained from the leading steelmakers who are producing so many of the essentials of war at the present time and from large manufacturers of ammunition, many of whose important plants are located in this territory. These plants, including the Bethlehem Steel Co., the Midvale Steel & Ordnance Co., the Remington Arms Co., the Baldwin Locomotive Works, the Pennsylvania Steel Co., and others, now are working on contracts for shells, forgings and other parts for military or naval use, which have been ordered in regular course by the government. None of these manufacturers has received orders or re-

quests to hurry forward the completion of these contracts or to give them precedence over other work. This is interpreted to mean that the national authorities, having had ample time to prepare for such eventualities as may grow out of the present situation, have accumulated in the arsenals all the necessary arms and ammunition that reasonably may be required. Accordingly, there is little need to urge redoubled speed on work in progress, especially at the present stage of the Mexican trouble. But whatever may come later, the steel, ordnance and ammunition manufacturers of eastern Pennsylvania will respond to the government's call.

Government Must Co-operate With Private Manufacturers

Washington, March 14.—The possibility of the United States being forced to intervene in Mexico has brought to the front the necessity of changing the existing policy of the government which prevents the war department from co-operating to any substantial degree with private manufacturers in building up large capacities for making war material. At present, there is a prohibition against the purchase of any considerable amount of such material from private makers. It is further stipulated by law that contracts must in all cases be awarded to the lowest bidder. The existing army appropriation act provides that not more than $100,000 of the $2,900,000 appropriated for the manufacture of reserve ammunition for field artillery and other equipment may be used in the purchase of such ammunition, and not more than $170,000 of the $2,090,000 appropriated for the manufacture of field artillery equipment may be used for the purchase of such material. The army bills just reported out by the house and senate committees on military affairs, while carrying certain provisions with reference to co-operating with private manufacturers, do not sufficiently liberalize appropriations for the purchase of material. Officials of the war department have been and are working to make it possible to utilize the services of private manufacturers through provisions in the army and fortifications appropriations measures allowing, if necessary, the secretary of war to expend 25 per cent of the appropriations for material with private manufacturers. It is also desired that congress lift the ban with regard to limiting the award of contracts to the lowest bidders, so that such contracts may be made with those plants which are in better position to supply requirements.

The present policy of the government compels the war department to purchase most of its supplies from the arsenals, but in case of a war of any duration, it is obvious that this source of supply would be wholly inadequate.

As a matter of course, if a sudden demand for increased material arose, congress would make appropriations to cover the requirements, and large orders for munitions and equipment would be placed with private interests when they could not be filled by the arsenals. The war department now buys of private plants most of its heavy gun forgings and the major portion of the forgings for the field artillery. These forgings are being made at present by only two concerns. Unless specific legislation makes provision for the purchase of other supplies from private manufacturers, the principal material that will be bought from them by the war department in time of peace probably will be shells and shrapnel ranging in size from 3 to 6 inches. In case the department is granted the privilege of increasing its purchases from private makers, the war department, it is understood, would begin the construction of larger field guns, calling for greater sizes of shells and shrapnel.

Brig. Gen. William Crozier, chief of the bureau of ordnance, war department, considers that the extent to which the government should manufacture its own material should be sufficient to permit the manufacture to be carried on by economical methods, but beyond that point favors the practice of employing the private industries of the country in order that these might be prepared to serve the government's needs in case of emergency.

The government at present has 700,000 rifles of the new Springfield model and a little more than 300,000 of the old Krag. At the Rock Island, Ill., and Springfield, Mass., arsenals can be manufactured something like 200,000 rifles a year, running eight hours a day. At this rate, the government could supply an army of 1,000,000 men with rifles in five years, provided it did not have to make good the wastage, which has proved to be at least 40 per cent, perhaps more, per year. It is obvious that, aside from the 700,000 rifles now in the hands of the army, the national guard, and in reserve, there would not be enough rifles to go around for an army of 1,000,000 men. While no such army appears to be in immediate demand, conditions, other than those growing out of the Mexican situation, it has been held, might easily call for a still greater army than that number.

At present the war department has in stock 750,000 projectiles, ranging from 3 to 6 inches, for the ordinary field artillery, and has about 1,000 guns, averaging approximately 700 projectiles per gun. This is less than half of the supply recommended by the Greble board, and a small percentage of that recommended by the Treat board, and not more than one-quarter of the supply recommended by Gen. Crozier. The war department having on hand or under construction about 1,000 field guns, and with a ratio of 4.9 or 5 guns per 1,000 troops, could supply an army of 200,000 men. Manufacture in arsenals would be limited by the rate at which gun carriages and other vehicles could be carried out; that is, the limbers and caissons, etc. The only arsenal which the government has for making field artillery vehicles is at Rock Island, and it can do about $1,000,000 worth of work on field artillery vehicles a year. Considering the field artillery material based on the Greble board's standards, and not on the Treat board standards, for an army of 500,000, it would take the Rock Island arsenal alone about 35 years to turn out these vehicles.

Meacham's Lecture

The Detroit Foundrymen's Association held a special meeting March 9, at which plans were discussed regarding the business policies of its members, of whom 300 were present. After the meeting the association was entertained with a motion picture lecture by Standish Meacham, of Rogers, Brown & Co., entitled "From Mine to Molder", which showed by moving pictures the process of the manufacture of iron and steel from the time the ore is mined until it is turned into the finished product. The officers of the association are as follows: President, A. F. B. Blackwood, of the Michigan Steel Castings Co.; vice president, Robert Carolin, of the R. B. Carolin Bronze & Aluminum Foundry Co.; secretary William A. Fletcher, of the American Blower Co.; and treasurer, Edward I. Chase, of the Cadillac Motor Car Co.

Sets Important Precedent

In Granting Pittsburgh Rate Concession—Possible Bearing on Basing Point—May Permit Still Lower Rate

Washington, March 14.—By its refusal to allow the railroads to extend the all-rail rate of 55c per 100 pounds on iron and steel articles from Chicago and all points between Chicago and the Mississippi river to Pacific coast ports back to Pittsburgh and common points and Cincinnati and common points, the interstate commerce commission in a decision today set a precedent. Instead of allowing the 55c rate to be extended further, the commission authorized the establishment of a rate of 65c per 100 pounds to be applied back as far as Pittsburgh. The present rate from Pittsburgh to Pacific coast terminals is 73.9c per 100 pounds, so that a reduction of 8.9c is made, and is to become operative upon five days' notice through the filing of revised tariffs with the commission. It is understood that this is the first time in the history of the commission that it has declined to permit the railroads to voluntarily reduce rates from a point o. origin, and by some it is construed as meaning that the commission does not longer accept Pittsburgh as the universal basing point for the establishment of rates on iron and steel articles.

The application to extend the 55c rate back to Pittsburgh was made by the railroads to meet water competition on traffic passing through the Panama canal and was supported by shippers in the Pittsburgh district and other districts that would benefit by the reduced rate. It was opposed by the American-Hawaiian Steamship Co., and the Luckenbach Steamship Co., by shippers of Chicago and by Atlantic coast shippers. When the rate of 55c from Chicago was authorized the western railroads gave notice that they contemplated extending it as far east as Pittsburgh and perhaps from the Atlantic seaboard, but at that time were unable to agree with their eastern connections concerning divisions.

The commission indicates that it in the future may grant the 55c rate to Pittsburgh.

Are Not Pleased

Pittsburgh, March 15. (By wire.)—Pittsburgh iron and steel manufacturers are dissatisfied with the decision of the interstate commerce commission giving the Pittsburgh district a 65-cent per hundred pounds rate on iron and steel material for shipment to the Pacific coast terminal. The reduction is 8.6 cents per hundred pounds. It generally was believed that the 55-cent rate now prevailing from Chicago would be extended to Pittsburgh. Traffic managers would not talk for publication.

Big Earnings

Of Cambria Steel Co. Makes New Record—Large Output

New York, March 15. (By wire.)—The Cambria Steel Co.'s annual report shows the largest net earnings in its history or $7,075,048, equivalent to over 14 per cent on the stock, an increase of $4,597,053.. The gross earnings were $8,326,672, an increase of $5,410,740. The surplus after dividends was $3,703,538. The output last year was 1,139,100 tons of pig iron, 1,452,276 tons of ingots and 1,021,462 tons of finished steel.

Buffalo Strike

Throws Out of Work Many Men Who Did Not Strike

Buffalo, March 14.—The strike of the local machinists' union continues at a dead-lock between the employers and the strikers. While not over 700 machinists went on strike two weeks ago, their action has resulted in shut-outs at the Pierce-Arrow Motor Co., the King Sewing Machine Co., the Ericsson Mfg. Co., and other plants, throwing out of work over 7,500 employes of all classes. One of these plants, the D. H. Stoll Co., has entered into a compromise agreement with its men and they have returned to work.

The union machinists, numbering 1,000 to 1,200 members of the 10,000 to 12,000 in the Buffalo district, struck for the 8-hour day, a 40-cent minimum for inside work, the elimination of piece and premium work and the recognition of shop committees.

Iron Pipe Advanced

Pittsburgh, March 15. (By wire.)—Manufacturers of wrought iron pipe today are sending out notices showing an advance of 1 point, or $2 a ton on the price of standard black pipe. Standard galvanized pipe has been advanced irregularly from 2 to 5 points. Sizes ⅛, ¼ and ⅜ standard and extra heavy galvanized iron pipe were put up 5 points and sizes ranging from ½-inch to 1½-inches extra heavy galvanized iron pipe were put up 4 points. All other sizes were put up 2 points, or about $4 a ton. The advance announced by wrought iron pipemakers is similar to that made by manufacturers of steel tubular goods. Iron boiler tubes will be advanced 2 points, or $4 a ton.

Metal Markets

New York, March 14.—With the exception of tin, lead and antimony, the metal markets continued to display a weak tone during the week closing today. Tin is held strongly owing to the fear of many sellers that they may be caught short on their contracts as a result of the difficulty in securing licenses for exporting the metal from England in the usual quantities. Sales of spot have been done as high as 55c and some sellers now are holding for 56c on spot. Demand is inactive.

The American Smelting & Refining Co. today advanced its asking price on lead to 7c, New York. This advance, however, did not result in putting this interest on a level with independent producers, who all along have been asking premiums. Today there were sales in the outside market at 7.50c, New York, and 7.37½c, St. Louis, for export, and sales were reported but not verified at as high as 7.75c, New York. Somewhat lower figures can be obtained, however, on domestic business, and the outside market may be quoted at 7.40c to 7.50c, New York, and 7.37½c to 7.40c, St. Louis.

The copper market has been in the hands of second sellers who have made offers of concessions without attracting much business. In fact, the market generally has reflected a condition of stagnation. On electrolytic and prime lake for prompt and nearby shipment second hand interest quote 27c to 27.50c, cash, while on June shipment the quotations are nominal at 26.25c to 26.75c. First hand prices are entirely nominal. Ordinary casting copper is quoted at 25.37½c to 25.62½c, cash.

The spelter market last Friday and Saturday firmed up considerably and prices displayed an advancing tendency on an improved volume of business. Yesterday the market sagged off again and as low as 15.50c, St. Louis, was heard on prompt prime western. Today a fair business was reported at somewhat higher prices. The market on prime western is quoted as follows: Spot and March, 16.25c to 16.75c, St. Louis; April, 15.75c; May, 15c; June, 14.25c. Brass special is quoted nominally at 19c to 19.50c, St. Louis.

Although the supply of aluminum in the outside marekt is limited, demand is exceedingly dull, with the result that some second hands have reduced their asking price on No. 1 ingots in carload lots to 59c without attracting buyers. The market is quoted nominally at 58c to 59c.

The antimony market is firm. Demand is of a small and scattered character but keeps up steadily. Wah Chang's W. C. C. antimony for spot delivery is quoted at 44c to 44.50c, duty paid. Domestic antimony for spot delivery can be had from some of the second sellers at 42c to 43c, New York.

Chain Advanced

Pittsburgh, March 14.—Chain manufacturers here put up prices $5 a ton to 5c for ⅜-inch proof coil. Demand is increasing in volume.

Renaissance of Eastern Ore Market

THE YEAR just past witnessed a remarkable reversal of conditions in the eastern mining field, as elsewhere in the iron and steel industry. After six months of stagnation the tide turned and long-dormant stock piles everywhere in the east melted in a short time under the pressure of an unprecedented demand

BY C. J. STARK

WAR and trade conditions combined to produce unusual and diverse effects in the eastern ore market in 1915. During the first half of the year, the poor market for iron and steel products proved to be a commanding factor. The demand for ore was light, and as many of the furnaces had carried over liberal stocks from the previous year, new purchases were limited and invariably were made at low prices. The very cheapest ores logically made up the market. The restraining effects that the war was to impose upon imports of ore, while generally recognized, were not put to the test, no necessity for it then existing. In the final six months of the year, however, the situation changed radically. Under the influence of swiftly rising prosperity, furnaces on all sides quickly resumed, stock piles long since regarded as dead capital to weigh upon the balance sheets of the owners were absorbed at a speed not considered within the scope of early possibility and a heavy requirement of new ore forced itself forward. Then the far-reaching effects of the war with their particular effects on the supply and transportation of foreign ore, sharply came into play. The direct outcome of these, notwithstanding the extensive last half demand, was to cut the shipments of foreign ore to the United States to approximately 1,350,000 tons, or practically the same as in 1914, with 1,351,368 tons, which was the lowest since 1908. Receipts of transatlantic ores were less than 300,000 tons, or the smallest since 1908. In 1914, they were about 410,000 tons; in 1913, about 500,000 tons, and in 1912, about 450,000 tons.

A world-wide shortage of vessels, bringing about a phenomenal advance in freight rates, operated to raise a high barrier against any outside ores which must be carried to this country over long ocean routes. From a normal rate on ore of about 8 shillings per ton, from the Mediterranean, the freight market quickly ascended to 13 shillings. The charters at the latter or for any figure, were few for ore or similarly low-grade cargoes involving loading and unloading delays; and the diverting of vessels from busy trade routes held forth little attraction to shipping companies, when compared with the lucrative returns obtainable for the carriage of coal, sugar and general commodities between the United States and Europe. The calling to the colors of the men in some of the foreign mines, notably in French Africa, also contributed to the restricted offerings of foreign ore. These conditions placed foreign ore, particularly of transatlantic origin, outside the field of competition, and left the eastern market wholly to the domestic product. In all the year, the new sales to this country of foreign ore, eliminating Cuba, were only about 50,000 tons, and much of this was mineral of a special and high-grade character, such as low phosphorus ore, for which the market was on a record-breaking level. A few cargoes of foreign ore were sold, where the sellers controlled the vessels or had made previous freight arrangements at favorable terms. The foreign ore imported from outside the North American continent, and imported in 1915, was not the result of new purchases but consisted of undelivered tonnages engaged in the preceding or earlier years. This was the case with Swedish ore, which furnished more than two-thirds of the transatlantic imports.

GENERAL VIEW OF THE TOFO DEPOSITS OF THE BETHLEHEM STEEL CO. IN CHILE, SHOWING POINT IN HILL WHERE ORE HAS BEEN REMOVED, AND LABORERS' VILLAGE IN FOREGROUND

Cuban Ore Shipments in Recent Years

	Total	South Coast	North Coast
1915.....	830,000*	520,000*	310,000
1914.....	850,000*	580,000*	270,000*
1913.....	1,582,431	1,090,718	491,713
1912.....	1,397,797	951,621	446,176
1911.....	1,163,714	775,922	387,792
1910.....	1,462,498	1,154,798	307,700
1909.....	936,132	936,132	.....
1908.....	620,836	620,836	.....
1907.....	650,174	650,174	.....
1906.....	640,574	640,574	.....
1905.....	651,159	561,159	.....
1904.....	387,273	387,273	.....
1903.....	623,527	623,527	.....

*Estimated.

The virtual shutting out of foreign ores from competition in the eastern market, gave an exceptional opportunity to Port Henry, local New York and New Jersey and Lake Superior ores, to capture the market, especially during the second half of the year. Shipments of Port Henry and the local eastern ores had risen to a record-breaking scale at the close of 1915, and when the books of these producers were opened in December for 1916 delivery, purchases exceeded in tonnage all previous contracting periods. Within a few days, approximately 2,000,000 tons of ore were disposed of at prices ranging from 8¼ to 9 cents, per unit, delivered in eastern

Panoramic view of the Cornwall ore bank at Cornwall, Pa., showingthe stock pile and loading pockets on the right and the hoist house and

Pennsylvania, depending on the grade and destination and at $4 per ton, at the mines, for lump, or an advance of 75 cents a ton, over the previous year. The Port Henry operators had practically sold up their full output to the end of the 1916, while the capacity of the local mines was engaged past July.

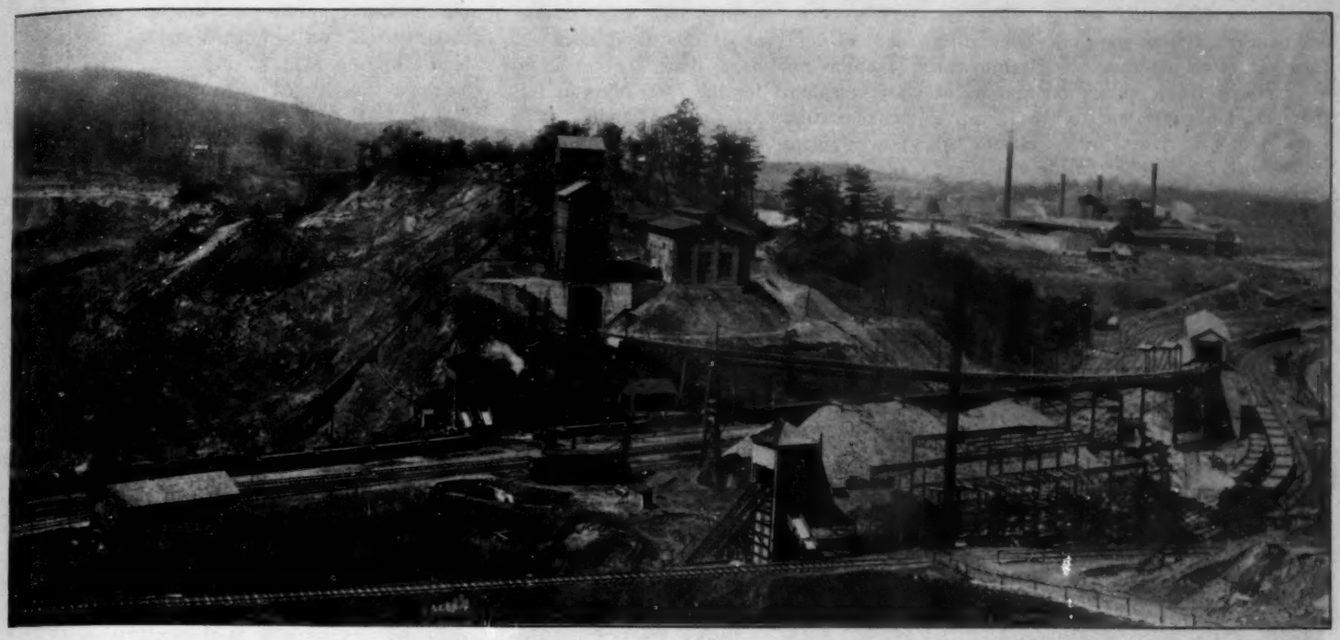
Lake Superior ores throughout the year enjoyed a favorable market level, and were bought heavily. Their prices for the 1915 shipping movement were on the equivalent of 8.35 cents, per unit, delivered eastern Pennsylvania for Mesabi non-bessemer and at 8.6 cents per unit, delivered, for old range, non-bessemer. At the advanced schedule for 1916 delivery which was adopted in December, these unit prices were raised to 9.80 cents and to 10.09 cents, respectively. Eastern Pennsylvania steel makers, especially those operating Cuban properties, bought large tonnages of lake ore during the year. Other eastern Pennsylvania steel companies contracted for important blocks. Merchant furnaces also were liberal buyers, a Lehigh valley company taking 100,000 tons and a Schuylkill valley interest 60,000 tons, as well as numerous other purchases.

Shortage of Vessels

Scarcity of vessels and consequent high freight rates were the important factors which checked the shipments to this country of Cuban ore during 1915. Had it not been for the transportation difficulties, the tonnage shipped would have been considerably larger. Liberal stocks of Cuban ore which were on hand in this country on Jan. 1, 1915, helped to make up for some of the loss of new tonnage, but did not prevent some of the companies receiving their main supplies from the island, from drawing upon the open market for larger quantities of lake and other ores to meet their increased demand. An outcome of the freight conditions of the year, was the decision of the Pennsylvania Steel Co. controlling the Spanish-American Iron Co., the leading Cuban producer, to build at Sparrows Point two modern 12,000-ton ore freighters for the Cuban service. Heretofore, this company had relied upon the chartering of vessels in the open market to carry its ore. These boats, which are expected to be ready in about a year, it is estimated, will carry about 600,000 tons annually. The providing of these vessels will go a long way toward placing the company in a self-contained position on its traffic requirements.

ANOTHER VIEW OF THE TOFO ORE PROPERTY SHOWING MACHINE SHOPS, OFFICES AND LABORERS' VILLAGE, WITH HOUSES OF ADMINISTRATION STAFF IN BACKGROUND

Total shipments of Cuban ore to this country in 1915 were approximately 830,000 tons, or only slightly in excess of those in 1914, which were the smallest since 1908. The Spanish-American Iron Co., as usual, shipped a large part of this tonnage. From Mayari, or north coast workings, were sent 308,896 tons and from the Daiquiri, or south coast deposits, 245,590 tons were brought in. This compares with about 270,000 tons from Mayari and about 290,000 tons from Daiquiri in 1914; and 491,713 tons from Mayari and 1,080,728 tons from Daiquiri in 1913. No important extensions of mining operations are contemplated by this company at the present time, since the properties now are in a position to ship very much larger quantities with adequate transportation facilities. In the Daiquiri district, the usual



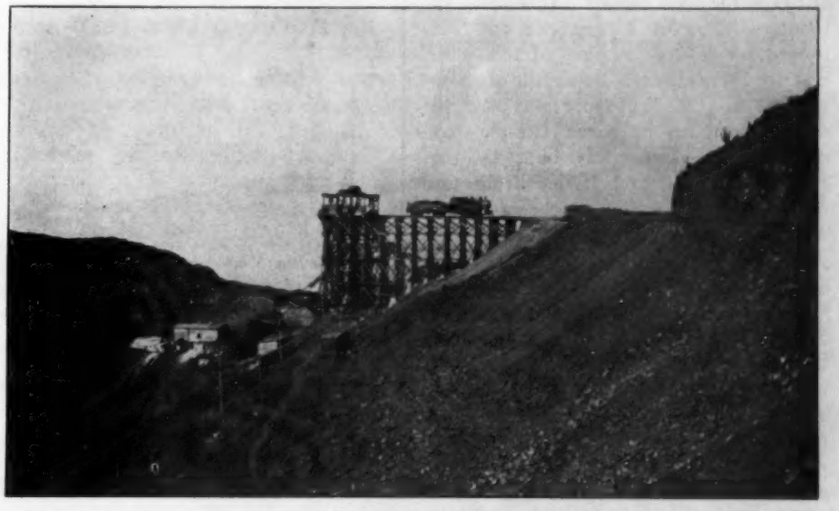
crushing plant on the hill above. One of the Cornwall blast furnaces of the Lackawanna Iron & Steel Co. is shown in the distance at the right

explorations are being continued. The Mayari property has been so thoroughly drilled that no further investigation is necessary, although the present sintering plant capacity may be increased later to correspond with larger shipping facilities. The Juragua Iron Co., a subsidiary of the Bethlehem Steel Co., shipped in 1915, 212,000 tons from the Diaquiri district, This compares with about 220,000 tons in 1914; 369,213 tons in 1913; 260,094 tons in 1912; 355,132 tons in 1911; 318,814 tons in 1910; 356,659 tons in 1909, and 366,580 tons in 1908. At the beginning of 1915, the mines of this company were idle, but they resumed work in the earlier part of the year.

Tonnage Represents Previous Sales

The merchant ore sold and delivered to eastern Pennsylvania furnaces by the Ponupo Manganese Co., from the Cuban south coast district, during the past year, was approximately 70,000 tons. This tonnage, in the main, represented sales which had been made during the previous year on the basis of 7 cents per unit, tidewater, for ordinary bessemer and 8 cents per unit, tidewater, for low phosphorus ore. In the latter part of 1915, this company disposed of a block of approximately 50,000 tons of low phosphorus ore for 1916 shipment, the purchaser being an eastern Pennsylvania furnace producing low phosphorus pig iron. The extraordinarily high level of the low phosphorus iron market had resulted in a material uplift of prices realizable on low phosphorus ore and it is understood this sale was made at around 11 cents per unit, tidewater, the highest figure for a mineral of this quality ever known in the eastern market. Low phosphorus ore prices in the year ranged from 10½ to 11 cents per unit, tidewater.

An important development in the Cuban ore situation in the year, which promises to bring into the field another large producer, was the acquirement in December, by the Midvale Steel & Ordnance Co., of the properties of the Beuna Vista Iron Co. of Cuba. These deposits are located in the southeastern end of the island near Moa bay. They have never been developed, and it is believed that their acquirement by the Midvale company will mean their active exploitation in the near future. It is estimated that the deposits embrace about 300,000,000 tons of ore of nickel-bearing quality. Dry analyses show 56 per cent metallic iron, 5 per cent silica, 1 per cent nickel, 0.018 per cent phosphorus, 0.15 per cent sulphur and 0.3 per cent moisture. Swedish ore imports the past year were approximately 210,000 tons, all of which went to the Bethlehem Steel Co. under a long-term contract which has been running for several years. This movement was about 70,000 tons less than in 1914. African ore deliveries were light, approximating 22,000 tons, compared with 46,175 tons in 1914. Freight conditions and the exigencies of the war, since this ore mainly has come from French Tunis, caused this reduction. Several cargoes of Benisof, Algerian ore, approximating about 17,000 tons, were sold in the year at the relatively low price of 7½ cents per unit at tidewater. This ore was sold on a favorable freight engagement. As in the preceding year, there were no new sales of Wabana, Newfoundland, ore to eastern furnaces in 1915, and there were



TEMPORARY CRUSHING PLANT AT THE BETHLEHEM STEEL CO.'S MINES AT TOFO, CHILE

no imports from that source. The unwillingness of the companies operating these mines to put their vessels into the ore-carrying trade, except on a basis of compensation equivalent to the lucrative rates obtained from other classes of traffic, placed this ore outside the range of competition. Later in the year, the

LOADING STRUCTURAL STEEL ON MOTOR TRUCKS AT CRUZ GRANDE, CHILE, FOR TRANSPORTATION TO TOFO MINES

miners suggested a prohibitive price of 11 cents per unit at tidewater, at which they might accept some business. The last previous sales of this ore had been at about 7⅛ cents per unit, at tidewater.

Chilean Exports Increase

During the year, the Bethlehem Steel Co. shipped to this country 146,000 tons of ore from its Tofo mines in Chile. The slide in the Panama canal interfered seriously with the season's shipping program of the company, since the Chilean mineral moves by that route and the expected tonnage brought in was curtailed considerably. The result was that the company was a very large buyer of ore in the open market. It took heavy tonnages of Port Henry ore and arranged for a large amount of this mineral for 1916 delivery. Some lake ore also was taken. The Tofo ore was shipped from the mines to Cruz Grande bay over the aerial tramway built by the French company, and loaded from the cantilever loading pier, which was fitted with a belt conveyor system during the year. During the first half of the year a great deal of construction work was carried on at the mines, looking to the permanent installation, by which it is hoped a production of 5,000 tons a day ultimately will be obtained. Much of this construction program now has been completed, there remaining under way the electric railroad, the turbine power station at Cruz Grande, and the basin dock. The electric railroad is about 80 per cent completed, the power house construction recently has been started, and 40 per cent of the basin dock excavation has been done. Foundations are completed for the 7.000 kilowatt turbine station at Cruz Grande. This power plant will furnish power for the mining operations, and for the electric railroad, which is 15 miles long and has a uniform grade of three per cent. The basin dock, when completed, will be 250 feet wide by 1,000 feet long, with storage and loading pockets on one side. Practically all the excavation is in solid rock and the basin, when completed, will have a depth of water of 40 feet. The construction work at the mines, including houses, offices, machine shops, temporary power station, etc., is practically completed.

The Bethlehem Steel Co. is planning to concentrate the handling of its Cuban and Chilean ore at the modern ore pier which the Lehigh Valley railroad is building at Constable Hook, N. J. This pier is 1,160 feet long and 84 feet wide. It will be equipped with two unloading machines, one of which will be of the Hulett "walking beam" type, with a Wellman-Seaver-Morgan bucket of 17 tons capacity, and the other will be a lighter "crane" type machine of five tons bucket capacity for smaller sea-going vessels, to be furnished by the Mead-Morrison Mfg. Co., Boston. The combined capacity of these machines is 1,000 to 1,400 tons of ore per hour. A channel has been provided, giving a water depth of 35 feet to the pier at mean low tide, enabling large sea-going vessels to be docked. The pier will be ready for operation early this year.

Port Henry is Active District

Shiments of Port Henry ore in 1915, were 555,855 tons, of which 404,095 tons were made during the last six months of the year. This compares with approximately 650,000 tons in 1914. Considerable of the ore shipped last year came from stock piles which were accumulated the preceding 12 months. At the beginning of 1916, however, the district was mining and delivering ore at the heaviest rate in history and, in view of the large tonnage booked for the year's delivery, as well as the extensions now under way, it appears that all records will be exceeded by a wide margin.

Witherbee, Sherman & Co., the leading Port Henry, N. Y., operators, are carrying forward a series of important enlargements to these operations, which will greatly increase their present output. During the year, the new No. 5 mill at Mineville, N. Y., for the concentrating of old bed ores, was completed and began operations in April. This unit is the largest of its type in the world and it takes the place of former mills Nos. 1 and 2, which were destroyed by fire the previous year. It has a capacity for treating 1,400 tons of crude ore in a 9-hour run. In the Smith mine at Mineville, a lower vein is being developed and shipments will be made from this to the new mill. From the Smith mine, the company's Lake Champlain & Moriah railroad is being extended to the Sherman tract, about one mile distant. The crude ore of this deposit runs about 40 per cent in iron and 0.30 in phosphorus. The mine is expected to be a shipper about April and it is being developed for a

Foreign Ore Imports During Last Five Years

	1915	1914	1913	1912	1911
Cuba	830,000	815,017	1,635,622	1,398,593	1,147,879
Sweden	210,000	280,887	356,074	333,863	219,238
Spain	42,000	66,982	112,580	92,061	194,965
Chile	146,000	45,000	.....	.....	.....
Canada	90,000	52,514	179,860	106,675	50,480
Africa	22,000	46,175	12,950	.....	4,443
Miscellaneous	10,000	44,793	297,684	173,584	184,727
	1,350,000	1,351,368	2,594,770	2,104,576	1,811,732

Of the tonnage imported in 1915, the port of Philadelphia received 687,780 tons; Baltimore, 572,813 tons; and the balance came in at Cleveland, Chicago and other ports.

production of about 1,000 tons of crude ore, and about 600 tons of concentrates, daily. The new No. 5 mill will work up the ore. In the Barton Hill mine, additional hoists have been installed underground. These improvements will raise the output of the mine and its mill built several years ago, to 10,000 tons of concentrates, monthly, analyzing 66 per cent in iron and 0.02 in phosphorus. With the Sherman mine in operation, Witherbee, Sherman & Co., Inc., in 1916 will have a total crude ore output in the Port Henry district of approximately 1,500,000 tons, and a concentrated yield of about 1,250,000 tons. This will represent an increase of 400 to 500 per cent in the company's mining operations during the past ten years.

To Build Large Dock

Provision is being made for the most efficient handling of this increased tonnage and of further additions to output to be made with the purpose of putting the properties of the company in readiness for the stimulus to its operations expected to come from the inauguration of traffic on the new Champlain barge canal now under construction. This canal, which will be a part of the enlarged New York State canal system, now going forward, will have a 12-foot stage and, according to present indications, will be in operation by Sept. 1, 1916. The present rate on Port Henry ore to New York City is $1.10 per ton. The rate by the new canal will be 50 cents per ton or less, enabling this ore to be laid down in the Lehigh and Scuylkill valleys in eastern Pennsylvania at a transportation cost of $1 per ton, compared with $1.60 per ton at the present time. The Witherbee-Sherman interests have within a few weeks awarded the contract for the construction of a large modern ore dock at Port Henry, on Lake Champlain, which will be the first of its kind on any inland body of water in the east. The dock will be 1,000 feet long and 250 feet wide and will have a storage capacity of about 350,000 tons. Loading from the dock to the barges will be done by an electric bridge with a clamshell bucket attachment. The company has closed a large contract for electric power for its general operations with the Hortania Power Co., which will be furnished from several water developments in Vermont and transmitted across Lake Champlain and from the plant of the Port Henry Light, Heat & Power Co., which is to be enlarged. The contract calls for a maximum of 14,000,000 kilowatt hours, annually. By means of this arrangement, all the properties of the Witherbee-Sherman interests will be operated from power derived from water plants. The present steam capacity and two small water power stations will be held in reserve. The Cheever Iron Ore Co., which is controlled jointly by Witherbee, Sherman & Co., Inc., and the Bethlehem Steel Co., is preparing to resume operations in its mines near Port Henry, which have been idle for more than a year. The mill is being renovated and improved, and an output of 5,000 to 8,000 tons of concentrates, monthly, is planned. Operations will be begun in April. The Port Henry Iron Ore Co. completed no important improvements in the year. In the Ausable district in Clinton county, New York, nothing was done in the year by Witherbee, Sherman & Co. toward developing the large ore tracts which it holds there.

The production and shipments of ore from the Cornwall bank in eastern Pennsylvania, for the fiscal year ending March 31, 1916, are estimated at 332,385 tons, being the smallest in many years. Both the output of the Cornwall Ore Bank Co. and of the Robesonia Iron Co., which are operating in the bank, showed a material reduction, the latter particularly so. Of the ore mined by the Cornwall Ore Bank Co. during the fiscal year now closing, the Pennsylvania Steel Co. received approximately 225,000 tons, leaving about 50,000 tons to other furnaces.

The comparative figures of production in tons of the Cornwall bank for the past 11 years, are as follows:

Year	Cornwall Ore Bank Co.	Robesonia Iron Co.	Total
*1916.....	269,221	63,164	332,385
1915.....	274,983	101,144	376,127
1914.....	307,911	100,339	408,250
1913.....	405,142	88,420	493,562
1912.....	337,051	80,694	453,745
1911.....	484,103	93,837	577,940
1910.....	525,792	103,628	629,420
1909.....	329,531	65,230	394,761
1908.....	476,517	99,094	566,611
1907.....	713,114	94,005	807,119
1906.....	669,511	62,877	732,388

*Estimated.

The only new construction carried on at the bank during the past year was a short railroad line from stripping operations to the dump. The stripping work has been continued all year. Facilities at present are provided so that a much heavier tonnage may be shipped and mined, as required. The Pennsylvania Steel Co. is planning to add to the concentrating and sintering plant at its Lebanon, Pa., furnaces, which will practically double the present output and will provide an annual ore consumption of 450,000 to 500,000 tons, about the middle of the year. This will mean that the Pennsylvania Steel Co. will call upon the Cornwall Ore Bank Co. for larger shipments of ore after July, 1916.

The Thomas Iron Co. increased its ore reserve in 1915 by taking a lease from the Wharton Steel Co. of the old Allen mine, at Wharton, N. Y., which adjoins the Richard mine of the Thomas Iron Co. on the east. The Allen mine had not been worked for many years, but the discovery of ore east of the offset in the Richard mine made it certain that large quantities of ore were in the Allen property. The Allen property has been entered on four different levels, 500 feet, 770 feet, 860 feet and 1,025 feet. The first two levels are in the north vein and the last two levels are in the south vein. Drifts have been driven across the property to a distance of 500 feet and a considerable body of ore has been developed. On July 1, preliminary work was started on the sinking of the new shaft on the Richard property, so as to reach the ore in the Allen mine and the balance of the ore in the Richard mine. This shaft will be a four-compartment, vertical shaft, put down to a depth of about 1,100 feet. Electric and compressed air lines have been extended from the power house to the new shaft. In Lehigh county, Pa., drilling for local hemetite has been carried on by the Thomas Iron Co. since September and four drilling machines have been putting down test holes. Considerable bodies of ore, consisting of red ore and brown ore have been located. It is expected that active operations will be begun soon.

Activity in New Jersey

The Empire Steel & Iron Co. is completing a new shaft at its Washington mine at Oxford, N. J., and is installing a modern magnetic separation plant, replacing the present unit, which will increase the present output about 50 per cent. These improvements are expected to be in commission by April. The shaft is to be sunk to a depth of 1,000 feet to reach the present lower workings, and much of the work has been completed. The company is operating to capacity its Mt. Hope, N. J., mine, in which during recent years, it has put through a series of important enlargements and betterments, both to the underground workings and to the surface plant. At present, shipments from the Oxford and Mt. Hope mines are running at about 30,000 tons monthly.

The Bacharach Industrial Instrument Co., Pittsburgh, Pa., has developed a pocket carbon dioxide indicator which it is said can be used to quickly and accurately determine the amount of carbon dioxide in flue and furnace gases. The test takes about 2½ minutes and the apparatus is so designed that it may be easily carried from place to place and operated by a comparatively inexperienced man.

The Jamison Coal & Coke Co., Greensburg, Pa., has advanced wages of coal miners and coke oven employes about 10 per cent.

The Zinc Smelter of Today

IN A paper by F. E. Pierce, consulting engineer, New York, read at a recent meeting of the Engineers' Society of Western Pennsylvania, it is stated that "the basis of the zinc industry is an ore supply". Continuing the author said in part:

The ores are mainly sulphides, known mineralogically as sphalerite or zinc blende, which carry approximately 30 per cent sulphur. These ores cannot be smelted unless the sulphur is driven off. This process is called roasting. The gas produced is principally a mixture of sulphurous acid gas and air and the laws of most states prohibit its free discharge to the atmosphere. The easiest way to dispose of it is to convert it into sulphuric acid which is done by two processes, known as the lead chambers and the contact process. The manufacture of sulphuric acid by itself is a most important chemical operation. Generally speaking, zinc sulphide ores will carry from 45 to 60 per cent zinc and 30 per cent sulphur, and one ton of average ore 50 per cent, will yield about 850 pounds of spelter and one ton of what is known as 60-degree sulphuric acid.

Today is the golden age of the zinc business. Spelter sold recently for 17 cents pound. A ton of 50 per cent ore costs about $100. The working costs are about $15 per ton of ore. About 850 pounds of spelter and a ton of acid are recovered. The spelter is worth about $135 and the acid about $40. The total receipts are, therefore, $175 and the costs $115, leaving profits of $60 per ton of ore. A 200-ton plant would return $12,000 per day, or pay for itself in less than eight months. In normal times, it would be lucky to pay for itself in 10 years.

Zinc has an atomic weight of 65.4; it is bluish white in color and has a crystalline fracture. It tarnishes on exposure, has a specific gravity of about seven, weighing about 435 pounds per cubic foot and has a tensile strength depending on its structure and purity of from 3,000 pounds and 10,000 per square inch. It is quite brittle when cold, but malleable and easily rolled between temperatures of 250 degrees and 300 degrees Fahr.; it is brittle again at 400 degrees Fahr., melts at 790 degrees Fahr., and boils at 980 degrees Fahr. Spelter is the commercial name for metallic zinc. Ordinary slabs of spelter weigh from 45 pounds to 70 pounds and measure 7 inches to 9 inches wide, 16 inches to 18 inches long and 1 to 1¾ inches thick.

Zinc dust, or blue powder, is very finely divided metallic zinc superficially oxidized and is produced by the sudden cooling of zinc vapors. It is used where a strong reducing agent is required. In roasting zinc sulphide ore (ZNS) zinc oxide is produced and the loss in weight is approximately 15 per cent. In other words, 100 tons of green or raw ore will, when roasted, result in about 85 tons of roasted ore.

Every spelter man has his own pet formula for his retort and condenser mixes, but the proportions of grog and plastic clay are approximately half and half. To this is sometimes added graphite or coke dust in the proportion of 10 per cent more or less. The spelter furnaces used in representative plants in this country include the Hegeler producer fired furnace; the natural gas furnace of the Hegeler type and the regenerative furnace of the Siemens or Neureuther type. Both the Hegeler and the natural gas furnaces have middle walls with ledges for supporting the butts of the muffles and front walls made of pillars and plates, held in place by buckstays. These furnaces have two arches, making really two furnaces in one block, back to back.

Zinc ores broadly are of two classes, oxidized and sulphides. The oxidized ores are easily reduced and play an important part in the smelting operation, but they are relatively of small tonnage and are used mainly for special purposes, as a front charge, or for mixtures to obtain a more reducible or non-slagging charge. The sulphides are the basis of nearly all the spelter produced. They are obtained from the well known districts of Joplin, Missouri, Wisconsin, Montana, Utah, Colorado, Mexico, Australia—almost everywhere in fact. In addition to the zinc, they may contain 2 to 10 per cent of lead, 2 to 15 per cent of iron and varying percentages of silica, lime, etc., and they may carry, in small percentages, silver, copper and gold. In almost all cases, the ores are concentrates from the run of mine of the district in which they occur.

Great attention has been given of late to the treatment of furnace residues, principally because of the silver values which they contain. A spelter furnace can be worked so that 60 to 70 per cent of the silver in the ore will remain in the residues. This may amount to 10 ounces per ton of residue. About 50 per cent of the lead in the ore will remain. This may amount to 50 to 100 pounds per ton of residues.

Will Test Fireproofing Materials

Tests are under way at the Pittsburgh laboratories of the federal bureau of standards on the rate of temperature rise within cylindrical specimens of the various materials used for fireproofing building columns. A special gas-heating furnace has been built for this work and a large number of cylinders of different materials have been prepared with suitable provision for inserting thermocouples axially, with their junctions at different distances from the heated cylindrical surface. Cylinders similar to the cylinder under test are placed at each end of the latter, in contact with its end faces, to minimize the disturbing effects of heat losses from the ends. As a preliminary to the tests of the building columns, some tests were made upon steel tubes to determine the relation between the load they will support and the temperature to which they are heated. The ultimate compressive strength was measured by mounting the tubes in a testing machine, the tubes being heated quite uniformly by suitably spaced electric heating coils wound over the outside and loss of heat from the ends being reduced to a minimum by asbestos disks. The temperature was measured by a thermocouple within the tube extending some distance beyond the center and then doubled back on itself to minimize the effects of conduction to the cooler ends. The behavior of such a tube may be expected to simulate closely that of a steel column. The tests were made primarily to obtain information as to what is to be expected in the much more elaborate tests of actual columns, and to serve as a guide in the design of the apparatus for those tests, especially the apparatus for measuring the temperatures of the columns. The results of these preliminary experiments seem to show that the protective covering on a steel column, to be effective in a fire, must prevent the structural steel from reaching a temperature in excess of approximately 1,150 degrees Fahr.

Electric Drive and Machine Tools

THE ARTICLE on "Electric Control for Machine Tools" which appeared in the March 2 issue of The Iron Trade Review is the subject of the accompanying discussion. Mr. James endorses the statements of Mr. Brooks relating to general requirements of electric control but differs on several important details

BY H. D. JAMES

MUCH engineering work has been done in connection with electric control for machine tools, and it is now universally recognized that the individual motor represents the best practice in this respect. One of the difficulties encountered in motor application to machine tools is the mechanical difficulty in the way of attaching the motor and controller to the machine tool so that it makes a presentable appearance. This difficulty is being overcome by tendency of the manufacturers of electrical apparatus to adapt their designs more closely to this service. Machine tool designers are also obtaining an increasingly better conception of the electric drive requirements. Much can be done by still closer co-operation between the designers of both classes of machinery. The writer believes in standardizing the exacting requirements of electric drive as far as practicable. Danger always exists that a rigid specification may hamper development in the art. It is better to standardize first on general requirements only, allowing the manufacturers of electrical apparatus as much leeway as possible in working out the details of their part of the equipment.

The apparatus described by Mr. Brooks is a good representation of controllers manufactured by one of the leading companies and, in the main, is representative of the art. Recent investigations made by the writer's company have led us to differ on some of the details of the requirements, however.

Mr. Brooks, in his article, specifies a field accelerating relay. The function of this relay is to prevent the operator from weakening the shunt field of the motor too rapidly during acceleration. The weakening of the shunt field causes the motor to take an increased current, the relay operating in the same manner as an ammeter. When the current increases to a fixed value, the relay closes a contact momentarily increasing the field strength of the motor. When the current drops, the relay opens again, and this alternating closing and opening holds the field strength of the motor at the desired value during acceleration. The operation in this respect is ideal and the relay has filled a long-felt want in many types of controllers. It has been found, however, that when the motor is operating at a high speed and the field rheostat is turned in the direction of reducing the motor speed, this increase in field strength causes the motor to act as a generator returning current to the line. If the change in field strength is considerable, this regenerative action may be very severe. Under these circumstances, the heavy current which flows, causes the field relay to close the current and still further strengthens the shunt field of the motor, causing an increased current flow. The operation of the relay in this respect is the opposite to what would be required for holding the current at its proper value. Our company feels that the detrimental action of the field relay causes sufficient harm to more than counterbalance its good effects during acceleration, and that, therefore, better results can be obtained by omitting this field relay and using another device for strengthening the motor field during the acceleration. On large motors our company has used two relays, one of which is operated during acceleration in the manner described above, the other relay taking care of the regenerative action. This, however, adds complication, and does not seem at present to be necessary for smaller motors.

Mr. Brooks states that motors below 25-horsepower should have fuses for overload protection. Our company is in favor of using overload relays on all sizes of motors, even down to 5-horsepower, where such a relay can be adapted to the controller specified. The first cost of the relay is more than that of the fuse, but the continual replacing of fuses is a running expense and may often amount to more than the cost of the relay during the first year of operation. A further objection to fuses is the fact that if they continue to open, a tendency exists on the part of the operator to put in heavier fuses. Where an overload relay is used, it is so easy to reset the relay that very little annoyance is caused. Usually the calibration of the relay is left at a reasonable value. Mr. Brooks de-

Summary of Mr. Brooks' Paper

IN THE early application of electric motors to machine tools, the motors were started by hand starters. While there are a number of cases in which these starters are still more applicable, we have reached the time when automatic starters, remote controlled, are the most suitable.

Some of the advantages of automatic control are as follows: The operating switch is easily attached to the machine, and the main panel may be located at a distant point. The starting time of the machines is automatically regulated to suit the load conditions on the motor. Accurate stopping points are obtained by "dynamic braking". All panels should be provided with a fool-proof enclosing case which meets all the applicable safety first requirements. Automatic starters and control apparatus should be provided with protection from low voltage on the line, also from excessive overload. The three general types of automatic starters are TIME ELEMENT, COUNTER ELECTRO-MOTIVE FORCE *and* CURRENT LIMIT. *Starters for small motors consist of line contactor, overload relay, field rheostat and connecting board. For larger motors, where one step of resistance is necessary, they include line switch and fuses, contactor, counter electromotive force accelerating contactor and connection board. For still larger motors the latter is modified to accommodate the additional accelerating contactors.*

At the present time, the problem of purely automatic control for general lathes has not been entirely solved, although lathes for a special class of work have been controlled with safety and efficiency. Automatic control equipment has been applied to boring mills, planers and slotters. Not the least important factor in the successful operation of an electrically controlled machine is the motor. For small printing presses, ventilating fans, small machine tools, woodworking machines, etc., the shunt motor is applicable, and for adjustable speed work it is suitable for planers, boring mills, heavy lathes, etc. The series motor should always have a certain friction load, and is thus applicable to centrifugal pumps, cranes and hoists.

clares that a graduated dynamic braking of two or more points is necessary on planers and boring mills. Tests recently made with the General Electric graphic recording ammeter on planer equipments, at the William Wharton shops, Jenkentown, Pa., indicated that the retardation of the planer bed was so rapid during dynamic braking that little or no difference existed between a single step dynamic braking and a graduated dynamic braking. In order to further analyze this condition our company made oscillograph tests on 7½, 15 and 25-horsepower motors of both variable and constant speeds. Motors of different maximum speeds and different voltages were used. The tests indicated that the graduated dynamic braking made practically no difference at the time of stopping, merely adding to the complication, cost and size of the control equipments. It further appears that a considerable variation can be made in the amount of resistance used in the dynamic braking circuit without materially affecting the time of stopping the motor. This investigation, which covers a period of over two years, has led our company to abandon the graduated dynamic braking, except in special cases where a considerable inertia load is stopped, the time of stopping covering over a considerable period. I should be very glad to know of other tests made in this direction, together with their results. It being important to reduce our controllers to a minimum number of parts, we should not introduce any refinements which do not pay for themselves in actual results obtained.

Contact Temperatures

Mr. Brooks states that the temperature rise on contacts and coils should not exceed 65 degrees under continuous operating conditions. This temperature rise, of course, applies to the particular apparatus which Mr. Brooks is describing. The safe temperature rise for any apparatus should be fixed by the materials entering into the design of the particular piece of apparatus considered. This temperature is high for some classes of apparatus and low for others. Recent improvements in insulation show that magnet windings can be operated at an actual temperature, measured by resistance, of 125 degrees Cent., giving good service over a long period of time. This comes under class *B* insulation, in the American Institute of Electrical Engineers' rules. The temperature of contacts is fixed by the fusing point of the material used, or, if it consists of a spring of any kind, by the temperature which draws the temper of the spring. The contacts subject to arcing, such as a line switch contactor, should be made of very refractory material, as the temperature set up in the contact by repeated operations is far in excess of any temperature to which the contact may be subjected by the passage of current itself.

Mr. Brooks cites a number of steps of resistance recommended by his company for machine tool service. The company I represent, however, has had drum controllers on the market for about ten years, having one step of starting resistance up to and including 15-horsepower, as well as two steps of starting resistance above 15-horsepower and including 35-horsepower. These drum controllers have proven very satisfactory in this respect. Further, our company conducted a series of oscillograph tests extending over a period of six months on several hundred different motors, and has adopted as a standard one step of starting resistance for motors up to and including 15-horsepower, and two steps of resistance above 15-horsepower, including 25-horsepower. Above that, the number of steps is determined by the motor and the service conditions. Most machine tool motors start up light, as it is not the practice to start a machine tool with the tool cutting material. The resistance, however, is sufficient to start the motor under full load, if necessary. The resistance used is determined by dividing the volts by the amperes and adding sufficient external resistance to provide a theoretical starting current of the proper value. As a matter of fact, the self induction of the motor reduces the current at starting considerably below this value, particularly when the motor starts up at less than full load. This reduction in the number of starting notches reduces the size and cost of the controller, and if the control is rugged enough to stand the service, it does not materially increase the wear on the resistance contactors. There are some types of control in which the switches used for short circuiting the starting resistance are light and a larger number may be required, in order to protect the switches.

The controller should be carefully adapted to the motor, some designs and types of motor requiring more refinement in control apparatus than others. It is the business of the electrical manufacturer to offer to the machine tool builder a complete electrical equipment having a maximum durability and a minimum complication. The size of the motor and controller is an important item and the number of parts of the controller should be reduced as far as safety will permit.

The American Manganese Steel Co., Chicago, has established an office in Pittsburgh at 202 Oliver building.

New Coal Pier

The Pennsylvania railroad has begun the construction at Canton Wharves, Baltimore, of a large coal pier. The structure will be completed by early summer. It will provide facilities for loading 20,000 tons of coal per day into vessels. The pier will be 940 x 66 feet. It is to be built on creosoted piles with reinforced concrete floor and concrete bulkhead. Space will be provided for loading four vessels at a time, utilizing both sides of the structure. To permit the transfer of coal from cars to ships in cold weather, a "thawing house", with a capacity of 30 cars, will be provided. Coal frozen in the cars will be quickly thawed out by steam so that it can be dumped easily.

In the operation of the pier, the cars will be pushed from the yard up on a "kick-back" from which they will descend by gravity to a dumper where they will be picked up and turned over, the coal falling into a hopper. Under this hopper, small 4-ton cars will be run, by means of an endless cable, up an incline and out on a trestle along the center of the pier. On both sides of this trestle, traveling unloaders will be provided. The small cars will be dumped automatically into hoppers constructed on these unloaders. The coal will then be elevated by a conveyor to telescopic chutes reaching into the holds or bunkers of the vessels. Storage bins also will be built at the end of the pier for different grades of coal for local harbor trade. These boats will be loaded by means of a small traveler. The plans for the pier include the construction of a storage yard, for loaded and empty cars, having a capacity of 1,000 cars.

The Maryland Dredging & Contracting Co., of Baltimore, has been awarded the contract for dredging at the dock and grading the new yard. The pier will be built by the Arthur McMullen Co., New York, and the machinery will be furnished by the Mead-Morrison Mfg. Co., Chicago.

Freight congestion in the east has led to some odd conditions and one of its most freakish manifestations was exhibited in the shipment of a 50,000-pound hydraulic press by express from Philadelphia to New England recently, because of the embargo on freight shipments into territory reached by the New York, New Haven & Hartford Railroad. The press was built by R. D. Wood & Co., Philadelphia, and is said to have been the largest and heaviest express package ever shipped from the Philadelphia district.

Is "Gruner's Ideal" Now Tenable?

MUCH TIME and study has been devoted to Gruner's law regarding the combustion of carbon in blast furnaces. In this article, the author discusses this law and points out that many successful American furnaces persistently violate this ideal and attain their lowest coke records by the direct reduction of carbon

BY HENRY PHELPS HOWLAND

DURING the last decade no topic has created more interest or received more thought among blast-furnace men than coke. One reason for this is, undoubtedly, the remarkable increase in the use of by-product coke. Formerly our coke was made at a distance from the furnaces and by a distinct organization. There was little co-operation or development possible under these conditions. Today the situation is greatly changed. Much of our coke is made by the organization operating the furnaces and the coke oven is operated with the primary object of obtaining the best results in the blast furnace.

The effect of changing the method of coke manufacture, even in some minor detail, is often felt almost immediately at the blast furnace. There naturally results one of the most valuable assets of the by-product coke oven, *i. e.*, the possibility of increased blast-furnace efficiency due to close observance and correct operation of the ovens. The results are evident, but it often is difficult to correctly account for them and in trying to solve the problem of why one coke is better than another, there are facts which should be kept clearly in mind. The author hopes to bring out some points relative to the use of carbon in the blast furnace which will be of value in solving this question.

Years ago Gruner made a statement regarding the use of carbon in the blast furnace, which has been very generally accepted by metallurgical and blast-furnace men. I quote this theory as given by Prof. Richards on page 248 of "Metallurgical Calculations:"

"From the standpoint of the generation of the maximum quantity of heat in the furnace, Gruner was right in formulating his dictum of the ideal working of a blast furnace, viz.: All the carbon burnt in the furnace should be first oxidized at the tuyeres to CO and all reduction of oxides above the tuyeres should be caused by CO, which thus becomes CO_2."

This quotation shows clearly that Gruner was speaking from the standpoint of the heat development in the blast furnace. The blast furnace and metallurgical world in general has corrupted this theory and applied it to fuel consumption. We have come to believe that a low-coke furnace gets a larger percentage of coke down to the tuyeres than a high-coke furnace.

Prof. Richards has well stated the commonly accepted view on the following page of the same book where he says:

"This proportion, or percentage, will not necessarily express how efficiently the furnace is running as regards fuel used per unit of iron made, but it will tell what proportion of the calorific power of the fuel used is being generated at the tuyeres and in possibly *nine cases out of ten* this proportion indicates the general efficiency of the furnace as regards fuel consumption."

The following example illustrates this theory:

Take a furnace using 2,100 pounds of coke of 88 per cent carbon, or 1,848 pounds of carbon per ton of iron: Assume that 100 pounds of this carbon is not gasified, but is used to supply the carbon for the iron and flue dust, thus leaving 1,748 pounds that could be burned at the tuyeres. If we find that 85 per cent of this, or 1,486 pounds, was burned at the tuyeres we must then say that this furnace is 85 per cent efficient as regards fuel consumption. This line of reasoning would lead us to believe that when we reached 100 per cent efficiency the carbon gasified at the tuyeres

Contributed to the proceedings of the American Institute of Mining Engineers. The author, H. P. Howland, is superintendent of blast furnaces, Wisconsin Steel Co., South Chicago, Ill.

Table I.

Data on Coke Combustion

Furnace No.	Lb. coke per ton iron.	Tons iron per day.	Carbon in coke, per cent.	Kind of coke. Meth'd of manufacture.	Operation.	Gas analysis—Per cent by volume CO_2	CO	CH_4	$\frac{CO_2+CO}{CH_4}$	N	H	Pounds carbon to gas.	Calculated quantities per ton iron. Cut. ft. gas 62 deg. Fahr.	Cu. ft. air 62 deg. Fahr.	Cu. ft. air per lb. coke.	Pounds carbon per ton iron. Total chgd.	Gasified in furnace.	Gasified at tuyeres.	Per cent carbon burned at tuyeres. Per cent total carbon.	Per cent gasified, carbon.
1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	2,615	301	86.3	BH	Stonega	10.3	27.6	0.2	38.1	59.8	2.1	2,251	187,200	141,600	54.2	2,254	2,110	1,868	82.8	88.6
2	2,551	272	84.4	BP	Solvay	11.3	26.9	0.6	38.8	59.0	2.2	2,182	178,200	132,800	52.0	2,153	2,049	1,751	81.4	85.6
3	2,472	482	86.1	BH	Conn.	12.3	25.8	0.0	38.1	58.4	3.5	2,133	177,300	131,000	53.0	2,128	1,996	1,728	81.2	86.6
4	2,247	450	87.1	BH	Conn.	11.8	26.2	0.1	38.1	58.5	3.4	1,978	164,440	121,600	54.2	1,957	1,846	1,605	82.0	87.0
5	2,198	499	86.9	BH	Conn.	12.5	26.8	0.3	39.6	58.0	2.4	1,933	154,600	113,200	51.6	1,908	1,810	1,494	78.7	82.6
6	2,123	514	88.3	BH	Conn.	12.8	26.0	0.2	39.0	58.0	3.0	1,905	154,800	113,500	53.4	1,875	1,764	1,498	79.8	84.9
7	2,115	360	84.3	BP	Solvay	14.2	25.3	0.0	39.5	57.9	2.6	1,826	146,500	108,200	51.2	1,782	1,683	1,427	80.1	84.8
8	1,996	490	86.3	BP	Koppers	13.8	26.0	0.2	40.0	57.4	2.6	1,713	135,600	98,400	49.3	1,722	1,611	1,298	75.4	80.6
9	1,936	376	85.7	BP	Solvay	14.6	24.7	...	39.3	57.4	3.3	1,689	137,000	98,900	51.1	1,659	1,557	1,305	78.8	83.7
10	1,905	393	88.7	BP	Solvay	14.5	26.0	...	40.5	56.4	3.1	1,700	132,900	94,900	49.8	1,690	1,575	1,252	74.1	79.5
11	1,901	517	85.5	BP	Koppers	13.6	24.9	0.2	38.5	58.0	3.2	1,610	132,400	97,000	51.0	1,625	1,524	1,280	78.8	84.1
12	1,863	504	86.6	BP	Koppers	14.0	25.3	0.2	39.5	57.4	2.6	1,602	128,500	90,500	50.0	1,614	1,513	1,230	76.2	81.3
13	1,780	426	84.9	BP	Koppers	14.2	26.0	...	40.2	56.2	3.6	1,519	120,000	85,200	48.0	1,511	1,414	1,124	74.4	79.5
14	1,742	503	84.6	BP	Koppers	15.4	22.8	1.2	39.4	57.1	3.7	1,480	119,000	85,925	49.3	1,474	1,382	1,133	76.9	82.0
15	1,716	542	87.1	BH	Benham	15.7	22.8	...	38.5	57.8	3.7	1,505	123,800	93,200	54.2	1,494	1,396	1,194	80.0	87.0
16	1,715	585	84.6	BP	Koppers	15.4	22.6	1.4	39.4	57.1	3.5	1,456	117,300	84,530	49.3	1,451	1,357	1,114	76.7	82.2
17	1,702	543	87.5	BP	Koppers	14.2	25.2	0.2	39.6	57.3	3.1	1,476	127,500	85,600	50.3	1,490	1,388	1,130	75.9	81.5
18	1,699	572	87.0	BP	Koppers	14.9	23.5	0.2	38.6	57.3	4.1	1,472	120,800	87,600	51.6	1,479	1,387	1,155	78.2	83.4
19	1,673	580	88.6	BH	Benham	15.1	23.6	...	38.7	58.6	2.8	1,477	121,000	89,600	53.4	1,482	1,384	1,182	79.9	85.0
20	1,658	590	88.3	BH	Benham	15.5	22.9	0.1	38.5	58.7	2.8	1,467	120,600	89,600	54.0	1,464	1,366	1,182	80.8	86.5
21	1,636	442	89.5	BP	Koppers	14.2	25.2	0.2	39.6	57.6	2.8	1,464	117,100	85,200	52.0	1,463	1,369	1,124	76.8	82.1
22	1,635	593	88.5	BH	Benham	15.5	23.3	0.0	38.8	58.3	2.9	1,434	117,000	85,200	52.1	1,447	1,349	1,124	77.7	83.4
23	1,624	592	87.3	BH	Benham	14.8	23.6	0.2	38.6	58.3	3.1	1,401	115,000	84,800	52.2	1,417	1,317	1,118	79.0	85.0
24	1,623	457	89.6	BP	Koppers	15.3	24.8	0.2	40.3	57.0	2.7	1,453	114,700	82,600	50.9	1,454	1,360	1,090	75.0	80.2
25	1,589	608	88.3	BH	Benham	15.3	23.5	0.0	38.8	58.2	3.0	1,390	103,400	83,300	52.4	1,403	1,307	1,100	78.5	84.2
26	1,584	466	89.2	BP	Koppers	15.7	24.6	0.2	40.5	56.9	2.6	1,423	111,300	80,100	50.6	1,413	1,324	1,057	74.8	79.9

would be 1,486 pounds and that would be all that was gasified. We would then require in this perfect furnace 1,486 + 100 = 1,586 pounds of carbon or

$$\frac{1,586}{88} = 1,800 \text{ pounds of coke.}$$

Again, when a furnace was using 2,500 pounds of coke the efficiency would be

$$\frac{1,486}{(2,500)\ .88 - 100} = \frac{1,486}{2,100} = 70.8 \text{ per cent.}$$

and only 70.8 per cent of the acrbon should be burned at the tuyeres.

The only reason for the belief in this commonly accepted theory must be that no one has ever made any calculations along this line, on furnaces of high and low-coke consumption.

Somewhat over a year ago our low-coke furnace was found to be gasifying no greater percentage of coke at the tuyeres than a previous furnace using 2,100 pounds of coke. This fact being proved for our individual furnaces, it seemed well to compare the results with those on other furnaces. With this in view, data from other plants were obtained and the results of the calculations are shown in Table I. The method of calculations is as follows:

All figures are based upon the 2,240-pound ton of iron as a unit. All volumes are corrected to 62 degrees Fahr. The air blown is assumed to be dry at 62 degrees Fahr. which, of course, while not exactly true, is assumed thus to simplify the problem. The total carbon charged in the coke minus the carbon in the pig iron, and the carbon in the flue dust, leaves as a remainder the carbon that is gasified and can leave the furnace only in the form of gas. The carbon in the limestone can also leave only in the furnace gas. The sum of these amounts of carbon gives us the pounds of carbon in the furnace gas that can appear only in the form of CO, CO_2 and CH_4. The pounds of carbon in 1 cubic foot of either CO, CO_2 or CH_4 is the same, due to Avogadro's law. Hence, having the total pounds of carbon going to the gas, we obtain the cubic feet of CO, CO_2 and CH_4.

The furnace analysis shows what per cent of the total gas these carbon gases constitute and thus enables us to obtain the cubic feet of gas per ton of iron. The gas analysis also gives the percentage of nitrogen and thus we arrive at the cubic feet of nitrogen per ton of iron, and as this can only come from the air, we determine the air actually delivered to the furnace per ton of iron. Dividing this latter figure by 75.8, which is the ratio of the atomic weight of carbon to that of oxygen, gives us the pounds of carbon burned at the tuyeres.

This can then be expressed as may be desired, either in per cent of total carbon charged or of carbon gasified in the furnace. The method is outlined in a specific case as follows:

Furnace No. 1, Wisconsin Steel Co. October, 1914.

1—Tons per day, 542.
2—Coke, 1,716 pounds.
3—Limestone, 912 pounds.
4—Flue dust, 89 pounds.
5—Carbon, per cent, coke, 87.08 per cent.
6—Carbon, per cent in limestone, 12 per cent.
7—Carbon, per cent in flue dust, 10 per cent.
8—Carbon, per cent in FE, 4 per cent.
9—Gas, per cent, CO_2, 15.7 per cent.
10—Gas, per cent, CO, 22.8 per cent.
11—Gas, per cent, CH_4 0.
12—Gas, per cent, N_2, 57.8 per cent.
13—Cubic feet air per minute = 35,385.
14—Temp. of air to engines 65 degrees Fahr.
15—Time lost, minutes per day, 21.
16—Pounds carbon to gas = (2) (5) + (6) (3) — (2,240) (8) + (4) (7) = 1504.5.
17—Per cent carbon gases in gas = (9) + (10) + (11) = 38.5.
18—Pounds carbon gasified (16) — (3) (6) = 1,395.5.
19—Cubic feet gas at 62 degrees Fahr. = $\frac{(18)}{17} \times 31.69 = 123,848$.
20—Cubic feet actual air at 62 degrees Fahr. = $\frac{(16)}{(12)}$ per cent N 40.06 = 90,497.
21—Pounds carbon gasified at tuyeres, $\frac{(16)}{75.8} = 1,194$.
22—Carbon gasified at tuyeres per cent gasified carbon = 85.7 per cent.
23—Carbon gasified at tuyeres per cent total carbon = 80.0 per cent.
24—Cubic feet of air per pound of coke actual = 52.8 at 62 degrees Fahr.
25—Cubic feet of air per pound of coke, engine reports = 53.1 at 62 degrees Fahr.
26—Cubic feet of air, engine room reports $\frac{(13)(1,440 - (15))521}{(1)(459 + (14))} = 92,200$ at 62 degrees Fahr.
27—Blowing efficiency = $\frac{(20)}{(26)} = 98.2$ per cent.

Aside from the fact that there may be some nitrogen from the coke and that we have assumed the air to be dry at 62 degrees Fahr., the method is exact. In my opinion, neither of these points is of enough value to counteract the complications introduced by using them. It is realized, of course, that the value of such a table depends primarily upon the accuracy of the data upon which the calculations are based. When the data were requested from the several different plants the desirability of having it accurate was given the utmost emphasis.

The greatest stumbing block was gas analysis and I am becoming more and more convinced that the average analysis of blast-furnace gas is almost worthless for calculation purposes. The reason for this lies primarily in its sampling, which, to obtain correct results, needs to be closely followed up by someone who realizes its importance and will see that the sampling is correctly done. We have followed up this matter quite persistently at our plant for several years. There are two things which, if watched, will, generally speaking, show the accuracy of gas analysis, namely the per cent of hydrogen and the sum of the carbon gases.

The hydrogen should be different for different periods of the year. The moisture in the ores and coke give about 2 per cent hydrogen in the gas. Five grains of moisture in the blast means about 1 per cent hydrogen in the gas. Thus, in the winter months, our hydrogen should be about 2.3 per cent and increase gradually up to 3 per cent and possibly more in the more humid days. Of course, with a dry blast plant this figure would remain practically a constant at about 2.0 per cent.

Regarding the sum of the carbon gases, there is no reason, with a given condition of furnace operation, why this should not remain practically a constant. It certainly should not vary much from day to day and should never be much below 38 per cent or much above 39.5 per cent. In some of the data sent me, the H was as low as 1 per cent and the sum of the carbon gases varied from 36 per cent to 41 per cent.

By careful observance of these two points one can be sure of getting as accurate analysis as is practical to obtain. A gas analysis incorrect as to the sum of carbon gases will make impossible correct determinations of the wind blown. The degree to which this error affects the wind blown may be illustrated as follows:

Referring to our general formula for air

$$A = \frac{\text{pounds of carbon to gas}}{\text{per cent of carbon gases}} \text{ per cent N } (40.06)$$

We will assume these different gas analyses, one only of which is correct:

	(1)	(2) Per cent	(3)
CO_2	15	15.5	15.0
CO	24	24.5	26.0
CH_4	0	0.0	0.0
H	2.5	2.5	2.5
N	58.5	57.5	56.5
	100	100	100

The sum of the carbon gas is 39 per cent, 40 per cent, and 41 per cent, respectively, the 39 per cent being assumed as correct. Representing all the constants in our equation by K, the equation may be written:

$$A = K \frac{\text{per cent N}}{\text{per cent sum of carbon gases}} = K \frac{\text{100—per cent H—per cent N}}{\text{per cent sum of carbon gases}}$$

(1) $A = K\frac{0.585}{0.39} = K(1.50)$ — Correct analysis used.

(2) $A = K\frac{0.575}{0.40} = K(1.44)$—Incorrect analysis used.

(3) $A = K\frac{0.565}{0.41} = K(1.39)$—Incorrect analysis used.

This indicates that for each per cent error in reporting the sum of the carbon gas analyses, there will result 4 per cent error in the calculated wind.

The column No. 5 in Table I headed "Carbon in Coke" may need a word of explanation. The way this figure is obtained at various plants differs. For

example, at our plant while we screen out about 3 per cent of our coke, the coke figure per ton of iron is the total coke unloaded from cars into the pockets, divided by the tons of iron produced. In this case the car weights are those of the coke plant located several hundreds of miles from the furnace. At some of the by-product coke plants of the Chicago district the coke is screened at the ovens and the furnace is charged only with the screened coke. The method of arriving at the carbon in the coke may be illustrated with a coke of the following analysis, dried: Carbon, 92 per cent; moisture, 1.5 per cent; screenings, 3 per cent, and carbon in screenings, 80 per cent. The carbon in the coke is $(0.92 \times 0.985) - (0.80 \times 0.03)$, or 88.4 per cent. If the coke unloaded into the pockets divided by the production gives a coke consumption of 1,700 pounds, then $1,700 \times 0.884$, or 1,503 pounds would give the carbon charged in the coke.

If it is not the practice to charge the furnace with the screenings then the coke consumption would be $1,700 \times 0.97$, or 1,649 pounds and the carbon in the coke; 0.92×0.985, or 90.62. The carbon charged would be $1,649 \times 90.62$, or 1,494. This latter figure is lower than the correct figure because it is really incorrect to credit the screenings as a certain per cent of the coke because the carbon of the screenings is lower than the carbon of the coke. I am confident that on the whole the data used in these calculations are as accurate as could be obtained. Any blast-furnace man who is inclined to question the accuracy of the results obtained has only to apply the method to his own plant to be convinced. Table I shows clearly that, at least in these furnaces, there is no law governing the relation between coke consumption and the percent of the carbon which is burned at the tuyeres. For example, compare furnaces Nos. 5 and 18. In No. 5 the coke consumption was 2,198 per ton of iron and 82.6 per cent was gasified at the tuyeres. In No. 18 the consumption was 1,699 and 83.4 per cent was gasified at the tuyeres. There is a difference of 500 pounds of coke per ton of iron, with practically no difference in the per cent burned at the tuyeres. Starting with the high-coke furnaces at the top and glancing down the list, we find several such instances. Many of the furnaces toward the bottom of the list might be classed as ideal, from the standpoint of coke consumption, yet none of them aprpoach the point of burning 100 per cent of the carbon at the tuyeres.

The conclusion is plain, therefore, that none of the above furnaces, which I believe to be fairly representative of American blast furnace practice using Mesaba ores are working on the basis commonly called "Gruner's Ideal".

The question very naturally arises whether any blast furnace does or ever has gasified 100 per cent of its gasified carbon at the tuyeres. As far as the author is aware, no such instance based on accurate data has ever been cited. Furthermore, I expect to show that there is no reason why this condition should be desired.

Few figures in metallurgical writing are subject to more abuse in their quotation and use than that of cubic feet of air per pound of coke. We hear it quoted all the way from 45 to 70 and usually with no specification as regards temperature. It was used by J. E. Johnson Jr. in "Increased Fuel Economy in Smelting Iron Ores," in *The Iron Trade Review*, Jan. 29, 1914, page 239, as a basis of comparison of blowing equipment and even to prove that Greenawalt sinter is of great value, as compared to some of our fine Mesabi ores.

There are, of course, two values of this figure; the one almost universally used is the wind per pound of coke as quoted in our daily and monthly reports; the other, which is rarely used, the actual value as shown in the data of operation given in Table I. The first value which we will speak of as the *approximate wind per pound of coke* of course varies greatly. The *approximate* value is generally obtained by multiplying the engine revolutions for 24 hours by the air supposedly blown per revolution, and dividing this product by the number of pounds of coke supposedly charged during the 24 hours. This gives the usual *approximate wind per pound of coke* for 24 hours. No allowance being made for temperature, this figure cannot be quoted at any standard temperature.

It is only in recent years that any allowance has been made for variations in temperature. Many plants are at present using outside air and varying the revolutions of the engines with the thermometer. At many

Table II.

Data on Coke Combustion Additional to That of Table I

Furnace No.	——Dimensions—— Heights. Total. ft.	Tuyeres to top bosh. ft. in.	Diameter. H'th. ft. in.	Bosh. ft. in.	Stock line. ft. in	Capacity cu. ft. tuyeres to stk. line.	No. tuyeres.	Per cent silicon in iron.	Per cent carbon. Iron.	Stone.	Flue dust.	Coke dried.	Screenings.	Per cent moisture in coke.	Pounds per ton iron. Stone used.	Flue dust made.	—Engine room— reports. Cu. ft. air per min.	Temp. air to tubs.	Grains moisture.	Per cent coke scr'n'd out.
1	84	13 4½	13 0	19 3	14 0	14,060	8	1.62	4.0	11.8	25.0	88.7	80.0	2.25	1,192	225	30,040	34°	1.83	0.5
2	80	11 00	11 0	16 0	12 0	9,200	8	1.59	4.0	11.6	5.4	88.5	80.0	4.0	1,148	275	25,295	..	....	0.75
3	89	13 10	15 6	21 6	16 0	18,500	12	2.13	4.0	12.0	11.7	88.1	....	2.25	1,144	370	45,560	62°	1.55	...
4	85	13 00	16 0	22 0	16 0	19,500	12	1.56	4.0	12.0	8.2	89.8	82.0	2.5	1,097	461	44,213	82°	....	0.56
5	85	13 00	16 0	22 0	16 0	19,500	12	1.40	4.0	12.0	8.2	89.8	82.0	2.5	1,003	388	45,839	92°	6.44	0.39
6	89	13 10	15 6	21 6	16 0	18,500	12	1.93	4.0	11.7	12.7	90.7	80.0	2.25	1,208	180	46,090	52°	3.15	0.5
7	80	12 11	12 0	18 6	13 6	12,375	8	1.53	4.0	12.05	11.6	89.1	81.5	4.00	1,190	116	32,390	70	4.28	1.5
8	94	11 7	17 0	21 3	16 3	20,666	12	1.03	4.2	11.75	9.0	88.5	....	2.50	870	140	39,210	38	1.05	...
9	80	11 11	13 6	18 6	14 0	12,459	8	0.94	4.1	12.05	4.8	89.4	84.0	3.85	1,101	224	30,799	90	5.9	0.3
10	80	11 11	13 6	18 6	14 0	12,459	8	1.25	4.4	12.0	8.5	91.6	84.0	2.9	1,042	192	31,120	85	6.6	0.3
11	Same as	No. 8	.. .	.. .	.....	..	0.90	4.25	11.93	11.45	88.3	....		3.07	719	140	36,824	37	2.58	...
12	Same as	No. 8	.. .	.. .	.....	..	0.95	4.20	11.75	7.55	88.85	....		2.50	755	98	38,220	54	2.04	...
13	78	19 10	14 0	19 6	15 0	15,584	9	1.26	4.00	11.70	...	88.0	....	3.50	897	60	29,670	62	....	...
14	85	14 3	15 0	20 6	5 5	.....	12	1.00	4.00	12.00	2.0	89.1	87.0	4.32	828	135	36,368	60	4.0	1.7
15	90	14 00	16 6	21 6	16 0	20,222	12	1.62	4.00	12.00	10.0	92.0	80.0	1.55	912	89	35,385	65	....	3.2
16	90	14 3	16 6	21 4	16 6	.....	12	0.89	4.00	12.00	2.1	89.1	87.0	4.32	833	200	42,765	60	3.9	1.6
17	90	14 6	17 8	22 0	17 0	20,630	10	1.23	4.20	11.75	6.2	89.5	....	2.25	752	95	42,950	49	2.5	...
18	Same as	No. 17	.. .	.. .	.....	..	1.35	4.20	11.75	8.25	89.0	....		2.30	804	82	48,970	75°	5.5	...
19	Same as	No. 15	.. .	.. .	.....	..	1.56	4.00	11.95	9.5	93.3	80.0		1.85	780	94	35,615	62°	2.2	3.8
20	Same as	No. 15	.. .	.. .	.....	..	1.41	4.00	11.9	9.1	92.6	80.0		2.23	849	90	35,820	62°	1.7	2.8
21	Same as	No. 13	.. .	.. .	.....	..	1.36	4.1	12.0	4.8	91.8	....		2.5	792	31	30,050	70	3.8	...
22	Same as	No. 15	.. .	.. .	.....	..	1.62	4.0	11.9	8.0	92.2	80.0		1.4	709	99	35,210	56	3.8	3.0
23	Same as	No. 15	.. .	.. .	.....	..	1.48	4.0	11.7	8.8	91.2	80.0		1.6	714	125	35,680	62	1.8	3.0
24	Same as	No. 13	.. .	.. .	.....	..	1.19	4.1	12.0	6.9	91.9	....		2.5	775	...	29,910	75	5.0	...
25	Same as	No. 15	.. .	.. .	.....	..	1.67	4.0	11.7	7.1	92.3	80.0		1.5	712	94	35,570	62	3.4	3.3
26	Same as	No. 13	.. .	.. .	.....	..	1.20	4.1	12.0	7.6	91.5	....		2.5	828	...	30,210	58	6.4	...

Furnaces No. 24 and No. 26 used more flue dust than produced.

of these plants the wind per pound of coke is not reported at any standard temperature.

Another error of some importance is due to a varying coke unit. At the majority of plants the coke unit varies, as used from day to day, and at the end of the month it is found necessary to adjust the amount of coke charged to the furnace. The approximate wind per pound of coke for the month is, however, generally an average of the daily figure without any such correction being made. The correct method of deriving this figure is, first of all, to know the temperature of the air entering the air tubs. The total cubic feet of air for the entire 24 hours, based upon the engine displacement and allowing proper corrections for delays, corrected to 62 degrees Fahr. should be carried forward each day and added for a total for the month. By using this sum as a dividend, and the correct shipper's weight of coke for the month as a divisor, our quotation will be the approximate air per pound of coke delivered by the engines at 62 degrees Fahr.

The above method is the way to report our cubic feet of air per pound of coke as delivered by our engines, and yet I believe that there are few plants figuring it as carefully as outlined above. Aside from the two errors in method of calculation mentioned, there are the variables of air tubs, leaks in mains, valves and stoves, all of which tend to make the approximate wind per pound of coke unreliable.

Table III shows some values of this figure which are on record and which are fair samples of the way this figure is quoted. It may be but natural that furnace men have come to look upon much of the variation which has occurred in the quotation of this figure as due to conditions inside of the furnace.

Reasons for Quoted Variations

In attempting to account for these variations we have assumed that they were due to the kind of coke, the way the coke was being burned, an easily reduced ore, or an ore difficult to reduce, etc. When the facts in the case are realized, we find that practically all of the variation is due to our methods of figuring, variations in temperature, leaks in stoves, mains, etc.

Turning now to our other value, the actual wind per pound of coke, we find that the causes for variation are the carbon in the coke and the per cent of carbon which reaches the tuyeres. We have seen that it takes 75.8 cubic feet of air at 62 degrees Fahr. to burn 1 pound of carbon at the tuyeres.

Let us assume for illustration a furnace using 2,000 pounds of coke per ton of iron; the coke is charged having 87 per cent carbon and 100 pounds of carbon being used to supply the iron and flue dust. It follows that if every pound of coke that went into the top of the furnace reached the tuyeres and was burned to CO, the maximum wind possible per pound of coke would be:

$$75.8 \times .87 \times .80 = 52.76 \text{ cubic feet of air per pound of coke.}$$

This amount of air could never be used, simply because 100 pounds of the carbon was used for iron and flue dust, thus

$$2{,}000 \times 0.87 = 1{,}740 \text{ pounds of carbon charged.}$$

$$1{,}740 - 100 = 1{,}640 \text{ pounds of carbon gasified.}$$

$$\frac{1{,}640}{1{,}740} = 94.3 \text{ per cent of total carbon gasified in furnace.}$$

We therefore see that in reality the maximum air that can be used is:

$$75.8 = \frac{87}{100} \times \frac{94.3}{109} = 62.2 \text{ cubic feet air per pound coke.}$$

This furnace would be working along the lines of Gruner's ideal furnace. We have seen from Table I that instead of 94.3 per cent of the total carbon reaching the tuyeres, the figure is much more nearly 80 per cent. Hence, the correct figure becomes:

$$75.8 \times 0.87 = 65.95 \text{ cubic feet air per pound of coke.}$$

This figure will be a little higher as the coke consumption increases, due to the fact that the carbon necessary for the iron and flue dust is practically the same in ponnds, but naturally a lower percentage of the total, thus leaving a higher percentage which can be gasified.

Relation Between Wind, Coke and Production

A clear conception of the fact that the actual wind per pound of coke is a practical constant should tend to emphasize in our minds the value of low wind where we are seeking primarily low coke consumption. Tables IV and V are inserted and Fig. 1 plotted with the idea of emphasizing this point. These are based upon the following empirical assumptions which, aside from the blowing efficiency, are believed to be practically exact for nearly all furnaces: 52.5 cubic feet of dry air at 62 degrees Fahr. per pound of coke; engines delivering blast 1,420 minutes out of 24 hours, thus assuming a delay of 20 minutes; a blowing efficiency of 100 per cent. Let us assume that we have a furnace that should make 540 tons per day. By blowing various amounts of air we obtain the following results:

Cubic Feet Air per minute	Coke Consumption	Tons per day
34,000	1,700	541
36,000	1,800	540
38,000	1,900	540
40,000	2,000	540
42,000	2,100	541

On the other hand, if our coke consumption is to stay the same with the increased wind, then our tonnage will have to increase as follows:

Cubic Feet Air per minute	Tons per day	Coke Consumption
34,000	541	1,700
36,000	572	1,700
38,000	604	1,700
40,000	636	1,700
42,000	668	1,700

There could be little doubt as to which way the increased wind would

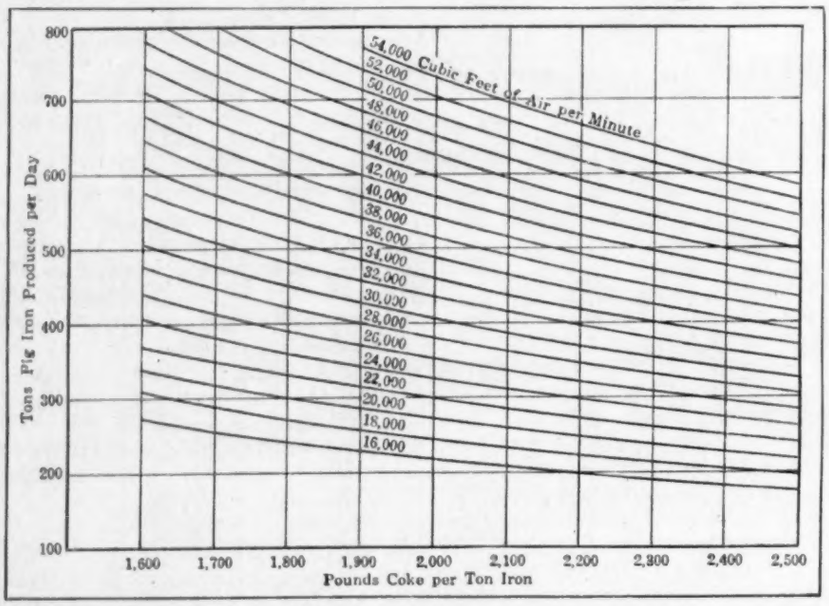


FIG. 1—RELATION BETWEEN WIND, COKE, AND PRODUCTION

work. As a matter of fact, it probably would not work out along either line exactly, but would result in both increased tonnage and coke, so that when we reached 42,000 cubic feet of air per minute, the result might be about 568 tons and 2,000 coke consumption, an increase of 28 tons per day and 300 pounds of coke per ton of iron, due to increasing the wind from 34,000 to 42,000 cubic feet of air per minute.

Low Coke and Low Wind

This table shows with reasonable accuracy the wind we are blowing per minute for any particular furnace. One who is operating a furnace producing 542 tons per day on 2,100 pounds of coke is actually blowing about 42,000 cubic feet of air at 62 degrees Fahr. If, according to engine reports, the figure is 45,000, then the blowing efficiency is

$$\frac{42,000}{45,000} = 93.4 \text{ per cent.}$$

These curves show us at once that it is practically impossible to obtain low-coke consumption unless we keep our wind low.

Table I shows a wide range of furnaces considered from the standpoint of coke consumption. The furnace at the top of the list burned 1,868 pounds of carbon at the tuyeres, whereas the best furnace burned only 1,057 pounds. The work accomplished was approximately the same in both cases. We are not so much interested in the question why the high-coke furnace took 1,868 pounds as we are in how the other furnace was able to get along with 1,057 pounds.

The Uses of Carbon

It has occurred to me that one help toward solving this problem is to analyze as simply as possible the work done by the carbon in the furnace. I have therefore taken furnace No. 19, using 1,673 pounds of coke, which, while not the lowest in the list, possibly serves better for comparison because of that fact. This furnace is No. 1 furnace of the Wisconsin Steel Co., which in the month of February, 1915, produced 580 gross tons of iron per day and 94 pounds of flue dust per ton of iron. The furnace consumed 1,673 pounds of coke, 780 pounds of stone and 75 pounds of scrap per ton of iron. The analysis of the iron was: Silicon, 1.56; manganese, 0.75; phosphorus, 0.075; carbon, 4.00; sulphur, 0.035, and iron 93.58 per cent. The coke as charged contained 88.6 per cent, the stone 12 per cent and the flue dust 9.5 per cent carbon. The gas was made up of carbon dioxide, 15.1; carbon monoxide, 23.6; hydrogen, 2.7; and nitrogen, 58.6 per cent, making the ratio of carbon monoxide to carbon dioxide 1.49. By the same methods used in calculating Table I, we find that the number of pounds of carbon charged was 1,482. Also 1,384 pounds of carbon were gasified in the furnace and 1,182 pounds at the tuyeres. The volume of gas amounted to 120,950 cubic feet at 62 degrees Fahr. and the air 89,600 cubic feet at 62 degrees Fahr. The carbon per ton of iron was 89.4 pounds and the carbon in the flue dust per ton amounted to 8.9 pounds. There were 93.6 pounds of carbon in the stone per ton of iron which gives 343 pounds of carbon dioxide in the stone.

The carbon in the stone does not, of course, interest us, except that it furnishes 343 pounds of CO_2 which either goes to the gas, or attacks the carbon of the coke. The iron per ton of pig iron is: 2240 × 0.9358, or 2,095 pounds. The excess scrap furnishes iron as follows: 75 × 0.85, or 64 pounds, thus leaving 2,095 — 64, or 2,031 pounds of iron to come from Fe_2O_3. This means

$$\frac{2,031}{0.70} = 2,901 \text{ pounds of } Fe_2O_3.$$

A certain amount of carbon is used in reducing the manganese, phosphorus and silicon. The following equations of these reactions are taken from Prof. Richard's book, quoted previously:

$$P_2O_5 + 5C = 2P + 5CO$$
$$MnO_2 + 2C = Mn + 2CO$$
$$SiO_2 + 2C = Si + 2CO$$

The atomic weights used in these equations are as follows: Iron, 56.0; hydrogen, 1.008; oxygen, 16; carbon, 12; phosphorus, 31; manganese, 55;

Table III.

Variation of Wind Per Pound of Coke

Period.	No. of furnaces.	Average. Coke.	Average. Air per lb. coke.	Individual furnace figures. Lowest coke. Coke.	Lowest coke. Air per lb. coke.	Highest coke. Coke.	Highest coke. Air per lb. coke.	Lowest air. Air per lb. coke.	Lowest air. Coke.	Highest air. Air per lb. coke.	Highest air. Coke.
Year—1906	91	2,343	64.9	1,989	56.8	3,238	60.0	53.1	2,137	82.0	2,419
Year—1907	94	2,362	65.0	1,945	68.6	3,212	63.0	48.3	2,473	87.8	2,337
Month—1908 ...	41	2,321	59.4	1,994	71.6	3,378	52.2	50.5	2,337	71.6	1,994
Week—1913	10	2,030	67.3	1,703	73.1	2,264	68.7	57.6	2,056	73.1	1,703
Month—1907 ...	11	2,464	72.6	2,245	85.6	2,996	90.4	60.8	2,396	90.4	2,996
Month—1908 ...	6	2,375	57.2	2,041	53.5	2,843	62.3	52.0	2,585	65.2	2,287

Table IV.

Relation Between Wind, Iron Produced and Coke Per Ton of Iron

Assuming Wind per pound of coke is 52.5. Blast furnished to furnace 1,420 minutes per day.

Cu. ft. actual air per min. / Coke per ton	16,000	18,000	20,000	22,000	24,000	26,000	28,000	30,000	32,000
1,600	271	304	338	372	406	440	474	507	541
1,700	255	287	318	350	382	414	446	477	509
1,800	240	270	300	330	360	390	420	450	480
1,900	228	256	285	314	342	371	399	428	456
2,000	217	243	271	298	325	352	379	406	433
2,100	206	232	258	284	310	336	362	387	413
2,200	197	221	246	271	296	321	345	370	396
2,300	188	212	235	258	282	305	329	352	376
2,400	180	203	226	248	271	294	316	339	361
2,500	173	195	216	238	259	281	303	325	348

Table V.

Relation Between Wind, Iron Produced and Coke Per Ton of Iron

Assuming Wind per pound of coke is 52.5. Blast furnished to furnace 1,420 minutes per day

Cu. ft. actual air per min. / Coke per ton iron	34,000	36,000	38,000	40,000	42,000	44,000	46,000	48,000	50,000	52,000	54,000
1,600	575	608	642	677	711	744	778	812	846	879	913
1,700	541	572	605	637	669	701	732	764	796	828	859
1,800	510	540	570	600	630	660	690	720	750	780	811
1,900	484	512	541	570	599	627	655	684	713	741	768
2,000	460	487	514	541	569	595	623	649	677	704	730
2,100	438	463	489	515	542	568	593	618	645	670	695
2,200	418	442	467	493	517	542	566	590	615	640	664
2,300	400	423	447	471	495	518	541	565	589	612	635
2,400	383	406	429	451	474	496	519	541	564	586	609
2,500	368	389	411	433	455	477	498	519	542	563	584

sulphur, 28. Now we have the following equations and calculations:

$$P_2O_5 + 5C = 2P + 5CO$$

1 pound of P requires $\frac{30}{31}$ pound of C.

Per ton of iron we have—

$2,240 \times 0.00075 = 1.7$ pound of phosphorus,

requiring $\frac{1.7 \times 30}{31} = 1.6$ pounds of C

producing $\frac{1.7 \times 70}{31} = 3.8$ pounds of CO

Manganese reaction—

$$Mn_3O_4 + 4C = 3Mn + 4CO$$

1 pound Mn requires $\frac{16}{55}$ pound of C and produces $\frac{112}{0.165}$ pound of CO.

Per ton of iron we have:

$2,240 \times 0.0075 = 16.8$ pounds of Mn.

requiring $\frac{16.8 \times 16}{55} = 4.88$ pounds of C,

producing $\frac{16.8 \times 112}{165} = 11.4$ pounds of CO.

Silicon reaction—$SiO_2 + 2C = Si + 2CO$

1 lb. of Si requires $\frac{24}{28}$ lb. of C. Produces $\frac{56}{28}$ lb. of CO.

Per ton of iron we have:

$2,240 \times 0.0156 = 35$ lb. of C.

requires $35 \times \frac{6}{7} = 30$ lb. of C.

produces $35 \times 2 = 70$ lb. of CO.

Summary.

	Carbon required, pounds.	CO produced, pounds.
Phosphorus reduction	1.6	3.8
Manganese reduction	4.9	15.0
Silicon	30.0	70.0
Total	36.5	88.8

We originally had 1,384 pounds of carbon gasified in the furnace and we have used 36 pounds, as shown above, leaving 1,384 — 36 = 1,348 pounds available for reduction of Fe_2O_3. Of this we know that 1,182 pounds is burned to CO at the tuyeres, leaving 166 pounds of carbon which can be used in direct reduction. We will therefore have available for reduction 2,901 pounds of Fe_2O_3, 166 pounds of solid carbon and 2,758 pounds of CO.

The amount of Fe_2O_3 we can reduce by means of these agents depends entirely upon how efficiently the work is done. We are told that there are a great many angles to this question of reduction. The temperatures and composition of the reducing gases may so interact upon one another that either oxidation or deoxidation may take place. There are many points involved in this question regarding which the author frankly admits his ignorance aside from what he reads in technical literature, and which he has no desire to discuss here.

Sir Lowthian Bell, upon whose researches most of our conclusions are based, remarks that while it might be possible, he doubts the probability of our ever being able to attain a ratio less than 2 to 1, by volume of CO to CO_2 in our top gases. Our analysis of the top gas on our small hand-filled furnace of Dec. 11, 1915 showed a ratio of 1.23.

I shall assume for the purpose of our discussion that the reduction of the Fe_2O_3 by either Co or C takes place under such conditions as to produce a ratio of 1 to 1 in the resulting gas. Any CO in excess of the amount required to reduce the ore under these assumptions must be considered as unused, and as passing to the gases as CO, then, of course, raising the ratio in the top gases above that of the reducing gases.

In the same way we will have to assume that any solid carbon not necessary for reduction is dissolved by the CO_2 of the gas, thus raising the CO percentage in the top gas. These empirical assumptions are made merely for the purpose of analyzing the work of the furnace, and as long as this point is kept clearly in mind no confusion need arise. The equation of reduction when written to meet these specifications will be as follows:

Indirect:

$$Fe_2O_3 + 6CO = 2Fe + 3CO + 3CO_2$$

Direct:

$$Fe_2O_3 + 2C = 2Fe + CO + CO_2$$

It will be noticed that in the case of the indirect reduction we employ 6C to reduce the same amount of Fe_2O_3 that is accomplished by 2C in the equation of direct reduction. According to this line of reasoning, direct reduction is three times as efficient, as regards carbon consumption, as is the indirect.

Returning now to the furnace under discussion, we can say that regardless of how the equations are written, we are sure of the following facts: First, that 2,901 pounds of Fe_2O_3 went into this furnace as ore and came out as 2,031 pounds of Fe in the iron and 870 pounds of oxygen in the gases. Second, that 1,384 pounds of carbon went into the furnace as solid carbon and came out as either CO or CO_2 in the gas. Our problem, as previously stated, is: given 2,901 pounds of Fe_2O_3 to be reduced by means of 166 pounds of solid carbon, and 2,758 pounds of CO. We now will make two assumptions, assumption *A* being that 166 pounds of carbon is used in direct reduction of the ore, the remaining ore being reduced by CO, all excess CO passing to the top gases. The equation for direct reduction tells us that 166 pounds of C reduces 166×6.667, or 1,107 pounds of Fe_2O_3 and produces

$166 \times 1.167 = 194$ pounds of CO
$166 \times 1.833 = 304$ pounds of CO_2

We have left 1,794 pounds of Fe_2O_3. This requires 1,884 pounds of CO for its reduction, and at the same time produces—

$1,884 \times 0.50 = 942$ pounds of CO

and

$1,884 \times \frac{11}{14} = 1,580$ pounds of CO_2

We have left 2,758 — 1,884, or 874 pounds of CO which passes to the gases without doing any reducing. The summary of Assumption *A* is as follows:

	Iron produced.	Carbon used, lbs.	Lbs. produced, CO.	Lbs. produced, CO_2.
Sl. Mn and P reduction	.....	36	89	...
Direct reduction of Fe_2O_3	775	166	194	305
Indirect reduct'n of Fe_2O_3.....	1256	807	942	1480
Unused CO	....	375	874	...
Stone	....	...	...	343
Totals	2031	1384	2099	2128

In assumption *B* assume that all CO made at tuyeres reduces ore and that the excess carbon is used by CO_2. Now,

2,758 pounds of CO will reduce

$2,758 \times \frac{160}{168} = 2,627$ pounds of Fe_2O_3

and produce

$2,758 \times \frac{5}{10} = 1,379$ pounds of CO

and

$2,758 \times \frac{11}{14} = 2,167$ pounds of CO_2

We have left 2,901 — 2,627 = 274 pounds of Fe_2O_3 to be reduced by direct reduction. This requires—

$274 \times \frac{2}{20} = 41$ pounds of C.

produces

$274 \times \frac{7}{40} = 48$ pounds of CO

and

$274 \times \frac{11}{40} = 75$ pounds of CO_2

We have left 166 — 41, or 125 pounds of carbon for which there is no way of accounting except upon the basis of its having been dissolved by CO_2, thus:

$$CO_2 + C = 2CO$$

Now 125 pounds of C will dissolve 458 pounds of CO_2 and produce 583 pounds of CO. The summary of assumption *B* is as follows:

	Carbon, used, lbs.	Produced lbs. CO.	Lbs. CO_2
Sl. Mn and P reduc..	36	89	0
Direct reduc., Fe_2O_3..	41	48	75
Indirect reduction.....	1,182	1,379	2,167
Stone	...	...	343
Dissolved by CO_2.....	125	583	—458
Total	1,384	2,099	2,127

We thus see that in whichever way we assume the reduction to take place the ultimate gas analysis is the same.

The gas analysis obtained by analyzing the gas of this furnace was 23.6 per cent CO and 15.1 per cent CO_2, and the cubic feet of gas was 120,950. Now

$120,950 \times 0.236 = 28,544$ cubic feet of CO
$120,950 \times 0.151 = 18,213$ cubic feet of CO_2
$(28,544)(0.07363) = 2,102$ pounds of CO
$(18,213)(0.1157) = 2,107$ pounds of CO_2

which shows that our data checks

fairly well in the calculated results. In assumption *G* let us suppose for the purpose of comparison that this furnace had consumed the same amount of coke but that the total of 1,348 pounds of carbon had all been burned to CO at the tuyeres. Under this assumption the furnace would be working along the lines of Gruner's ideal. This would require 1,348 × 758, or 102,178 cubic feet of air at 62 degrees instead of 89,600 originally blown. We will now produce 3,145 pounds of CO. We have 2,901 pounds of ore to reduce which requires 3,042 pounds of CO, and produces 1,521 pounds of CO and 2,387 pounds of CO_2. We have left 103 pounds of CO unused. The summary of assumption *G* is as follows:

	Carbon used, lbs.	Lbs. produced, CO.	Lbs. produced, CO_2.
Sl. Mn. and P reduc..	36	89	...
Direct reduc., Fe_2O_3..	...	...	...
Indirect reduc., Fe_2O_3.	1,304	1,521	2,387
Unused	44	103	...
Dissolved by CO_2.....	...	...	...
Stone	...	...	343
Total	1,384	1,713	2,730

Our gas analysis by volume will therefore become:

$$CO = \frac{1.713}{0.07363} = 23{,}265 \text{ cubic feet CO}$$

$$CO_2 = \frac{2.730}{0.1157} = 23{,}595 \text{ cubic feet } CO_2$$

$$N = 102{,}178 \times 0.791 = \frac{80{,}823}{127{,}683} \text{ cu. ft. of N}$$

The hydrogen being 2.7 per cent of the total, the above sum is 97.3 per cent of the total gas, or the cubic feet of gas produced at 62 degrees is 131,226. The gas analysis is: Carbon monoxide, 17.7 per cent; carbon dioxide, 18.0 per cent; hydrogen, 2.7 per cent, and nitrogen, 61.6 per cent.

The analysis of the working of this furnace under the three conditions outlined above is shown in Table VI. In looking over this table we see that had this particular furnace operated as shown in the Column G, that is, according to Gruner's law, the net result to the furnace plant would be a distinct loss. While the furnace would have used the same amount of coke per ton of iron the B. T. U. available in the furnace gas is greatly lowered. The result shows that for each pound of carbon gasified in the furnace, we would have used 1,256 B. T. U. more in the furnace when operating, according to Gruner's law, than when operating as the furnace really did operate. As this furnace gasified 1,384 pounds of carbon per ton of iron, and made 580 tons of iron per day, the net loss would be 91,600 pounds of coal in 24 hours, assuming coal to have a heat value as fired in the blast furnace boiler of 11,000 B. T. U. per pound. When we make a comparison of the gas analyses on these two furnaces, we see at once that they give no indication of the coke consumption, but only of the way the reduction takes place in the furnace. If we had been able to operate this furnace along the lines of columns A or B, Table VI, and produce a gas analysis as low as that in column G, the coke consumption would have been far below that shown in G. It is difficult for me to see how this furnace, as operated, would have been improved by endeavoring to operate it along Gruner's ideal, even assuming this to be a possibility.

J. E. Johnson Jr., in "Thermal Principles of the Blast Furnace," *Metallurgical and Chemical Engineering*, Dec. 15, 1915, gives a very complete analysis of the question of heat development in the blast furnace, and has found himself unable to depart from his original belief in the correctness of Gruner's ideal working. I have not as yet had time to give his article the study it deserves and it may be entirely possible that when I do, my ideas along this line will change. His whole case has, however, been presented almost entirely from the theoretical standpoint. It would have carried much more weight with blast-furnace men had he presented a few examples based upon accurate data of furnaces, operating along lines he claims to be essential for maximum fuel economy, namely Gruner's ideal. Had such furnaces been doing consistently better work than those shown in Table I, much force would be added to his argument. Until such examples are produced we care little about the theory.

All the furnaces in Table I are doing direct reducing. All those that are burning less than 1,350 pounds of carbon at the tuyeres are not making enough CO to reduce all the Fe_2O_3 and hence, some Fe_2O_3 must be reduced directly by carbon, and, as Professor Richards points out, this is done three times as efficiently from the standpoint of carbon required as when done by the indirect method. Certainly as we approach the end of the list, we find that our direct reduction is absolutely essential for there are furnaces toward the end which are not gasifying enough carbon, all told, to reduce the ore, had this carbon first been burned to CO.

I believe that Professor Richards was absolutely right in his statement on page 253 of *Metallurgical Calculations* when he says:

"The ordinary furnace produces at the tuyeres, in order to get heat enough to melt down the charges, more CO gas than is needed to abstract all the oxygen from the charges; under these conditions it is uneconomical to oxidize any carbon at all above the tuyeres. The exceptional furnace, because of pure ores, small amount of slag, pure fuel, high temperature of blast, or dry blast, gives heat enough at the tuyeres to melt down the charges without producing enough CO gas to reduce all the charges; under these conditions, more or less reduction is effected by solid carbon and with the greatest economy in quantity of carbon required in the furnace."

I am sure that the best furnaces, of which I have knowledge, persistently violate Gruner's ideal. Futhermore, the way we are getting our lowest coke records today is by doing a great deal of direct reduction. Even if we admit that the *corrupted* Gruner's theory is correct, it is of little use unless the furnace is acquainted

Table VI.

Use of Carbon Under Various Assumptions

Per Ton Iron (2,240 Lb.) — Wisconsin Furnace No. 1

	"A"	"B"	"G"
1. Coke, pounds	1,673	1,673	1,673
2. Carbon charged, pounds	1,482	1,482	1,482
3. Carbon gasified, pounds	1,384	1,384	1,384
4. Carbon reduction Mn. Phos. Sil., pounds	36	36	36
5. Carbon direct reduction Fe_2O_3, pounds	166	41	0
6. Carbon indirect reduction Fe_2O_3, pounds.....	807	1,182	1,304
7. Carbon in CO not needed for reduction, pounds...	375	0	44
8. Carbon dissolved by CO_2, pounds	0	125	0
9. Carbon gasified at tuyeres, pounds	1,182	1,182	1,348
10. Carbon used in reducing Fe_2O_3, pounds	973	1,223	1,304
11. Cubic feet, air per pound, coke, 62° Fahr.....	53.5	53.5	61.08
12. Analysis of Top Gas			
13. CO per cent by volume, per cent.....	23.6	23.6	17.7
14. CO_2 per cent by volume, per cent.....	15.1	15.1	18.1
15. H per cent by volume, per cent.....	2.7	2.7	2.7
16. N per cent by volume, per cent.....	58.6	58.6	61.6
17. Total B.t.u. per cubic foot top gas at 62°.....	84.0	84.0	64.8
18. Cubic feet gas per ton iron.....	121,000	121,000	131,200
19. B.t.u. per pound C gasified.....	7,344	7,344	6,143
20. B.t.u. in CO per cubic foot top gas.....	76.6	76.6	57.4
21. B.t.u. in CO per pound carbon gasified	6,697	6,697	5,441
22. B.t.u. lost to top gas per pound carbon gasified...	.....	.....	1,256

with the theory and willing to work along this theoretical line.

In Mr. Johnson's article he has attempted to bring into line the results obtained on our No. 1 furnace with those obtained by his figuring. In so doing, he has quoted our blast heat as 1,250 degrees Fahr. and the carbon in the coke as 93 per cent. The correct figures are 1,100 degrees and 89 per cent.

Conclusions

This article has developed along lines which will, undoubtedly, be criticised by some as being of but little practical value. We are, however, able to draw conclusions which will eliminate some of the factors in the question—why does one coke do better work than another? The conclusions would be that it is *not* because there is any difference in the percentage gasified at the tuyeres; or that there is any difference of wind required per pound of coke; or that there is any great difference in the carbon content of the coke. Having eliminated these three points from consideration, we must look elsewhere in endeavoring to answer our question. As noted before, all of our lowest coke furnaces are doing some direct reduction. The heat to enable this direct reduction to be carried on efficiently must come from the carbon burned to CO at the tuyeres. It seems clear, therefore, that in low-coke furnaces, one of the most important, if not the most important function of the carbon burned at the tuyeres, is to produce heat to enable the carrying on of the direct reduction, rather than to produce carbon monoxide for indirect reduction.

On this basis it becomes very essential that our carbon shall burn instantaneously to carbon monoxide in order that the resulting heat may be localized where needed. This should not be a question of seconds but of a fraction of a second. If our carbon is of such a nature that this burning carbon monoxide is a comparatively long process, more of it will be required than of the quick burning carbon in order to obtain the same concentration of heat at the desired point.

We would, therefore, say that the most desirable thing about a coke is that quality in the carbon which will allow of its being instantaneously burned to carbon monoxide and thus result in the maximum concentration of heat where needed.

Practically all of the furnaces in Table I, using less than 1,700 pounds of coke were using a coke made either wholly or largely from low ash, high volatile coal. While the carbon content is high, it evidently is not the quantity but the quality of the carbon that produces the low-coke consumption. The low-coke consumption goes hand in hand with low wind. The lower volume of gas resulting means, in a hearth of a given area, a lower velocity of the gases, thus tending toward concentration of heat. Following the same line of reasoning, we see the value of our big hearth areas and steep bosh angles, both of which tend to decrease the velocity of the gases and concentrate the heat where we need it.

The low wind and large hearths are comparatively easy of obtainment. The great problem will be to operate our coke ovens in such a manner as to obtain coke from inferior coal, the quality of whose carbon shall approach that of the carbon in the coke made from better coals. Judging from the advancement made in by-product oven operation during the last 10 years, we have every reason to anticipate the correct solution of this problem.

Magnesite in Southern Nevada

A massive deposit of magnesite of unusual character recently brought to the attention of the United States geological survey, promises to yield a large and readily available supply of this material. The deposit lies in Clark county Nev., in the valley of Muddy river, one of the tributaries of Virgin river, a few miles above the town of St. Thomas. The material has been known for some time as kaolin, and successful experiments for utilizing it as a porcelain clay are reported to have been made, though they have not yet resulted in the exploitation of the deposit. The recognized outcrops have been located as mining claims, and some preliminary exploration and development work has been done. A side track on the St Thomas branch of the San Pedro, Los Angeles & Salt Lake railroad, about three miles northeast of the northernmost group of claims offers a readily available railroad connection, and the station has been named Kaolin, from this deposit.

The so-called kaolin is stated by the geological survey to be, in fact, a magnesite, and was deposited in a highly magnesian sedimentary bed, a part of a regular stratified series of sedimentary strata exposed by stream channels that cut across a low ridge at the upper edge of Muddy valley. The deposit forms a chalky looking bluff, dazzlingly white in the bright sunlight. The material is porcelain-white, fine grained and massive, is remarkably free from foreign material, and has the structureless appearance and conchoidal fracture that is generally characteristic of magnesite. It is not so hard as the more typical magnesite, and it crumbles more rapidly on exposure to the weather. The deposit is included between tilted beds of conglomerate and sandstone below and shale above. The lower contact is sharply defined, but the magnesite grades off into the overlying beds. The purer part of the deposit consists of beds aggregating at least 200 feet in thickness. Within the section of purer material there are a few bands of sandy matter, but these are minor in amount and apparently almost negligible, as they could undoubtedly be avoided in mining. The whole section lies in the form of a "hog-back"—that is, the softer beds lap up against a uniform slope of the sandstone and conglomerate, which has a northeasterly dip of 30 degrees to 50 degrees.

Unlike most other deposits of magnesite in California and elsewhere in this country, this is not a vein deposit, such as occurs with serpentine, but resembles closely the deposits discovered in 1911 at Bissell siding, near Mohave, Cal., both being interbedded with sandstone and shale and of sedimentary origin. The deposit at Bissell, however, does not appear to be so large or regular as the deposit on Muddy river. The similarity in the composition of the magnesite from the two places is shown by the analyses given below:

	Muddy River, Nev. 1	Muddy River, Nev. 2	Bissell, Cal.
Silicon Dioxide	11.12	11.82	9.64
Alum. Trioxide and Ferric Oxide	.98	.94	2.45
Calcium Oxide	5.36	5.90	4.25
Magnesia	36.72	36.40	37.19
Carbon Dioxide	*44.15	*43.45	40.70
	98.33	98.51	94.24

*Determined by loss on ignition and therefore includes moisture.

The presence of from 5 to 6 per cent of lime shown by the analyses may prove a detriment to some uses of the magnesite, but in this respect the material closely resembles that from the Bissell deposit, at which magnesite was mined and shipped regularly in 1915. Samples of this material were noticed in a mineral cabinet at Las Vegas, Nev., last August by a geologist of the survey, who then recognized the material as probably magnesite, though he was informed that it was kaolin. Later he visited the deposit in company with one of the claimants, and was then informed that analyses made in Salt Lake City showed that it was magnesite. So far as known, however, no special importance has been attached to this fact, as the material was then being exploited at the Panama-Pacific exposition in San Francisco under the name of kaolin.

Largest Tonnage

Of Unfilled Orders Ever Held by Books of Steel Corporation

Unfilled orders of the United States Steel Corporation, by a wide margin, now are the largest in its history. The statement as of Feb. 29, issued at New York March 10, showed a grand total of 8,568,767 tons on the books awaiting shipment, which is 646,199 tons greater than at the end of January, and is 79,248 tons ahead of the previous high record of bookings reported, or on Dec. 31, 1906, when 8,489,718 tons were on hand. The increase over the previous high record is in fact much larger than the actual difference between the two totals since in the latter case, the inter-subsidiary business was included in the statement which is not done under the present method of monthly compilations. While the amount of this inter-company tonnage is not exactly known, it is believed to be a conservative estimate that the present unfilled orders are by 1,500,000 to 2,000,000 tons greater than at any time during the expansive market of 1906 and 1907.

The unfilled orders of the Steel Corporation at the close of each month in recent years, showing the changes in tonnage and per cent, are as follows:

Date.	Total.	Change, tonnage.	Change, per cent.
Dec. 29, 1916....	8,568,767	646,199+	8.16+
Jan. 31, 1916....	7,922,767	119,547+	1.53+
Dec. 31, 1915....	7,803,220	616,731+	8.58+
Nov. 30, 1915....	7,189,489	1,024,037+	16.63+
Oct. 31, 1915....	6,165,453	847,834+	14.06+
Sep. 30, 1915....	5,317,618	409,163+	8.13+
Aug. 31, 1915....	4,908,455	20,085—	0.04—
July 31, 1915....	4,928,640	250,344+	5.35+
June 30, 1915....	4,678,196	413,598+	9.69+
May 31, 1915....	4,264,598	102,354+	2.46+
Apr. 30, 1915....	4,162,244	93,505—	2.21—
Mar. 31, 1915....	4,255,749	89,622—	2.06—
Feb. 28, 1915....	4,345,371	96,800+	2.28+
Jan. 31, 1915....	4,248,571	411,928+	10.74+
Dec. 31, 1914....	3,836,643	512,051+	15.40+
Nov. 30, 1914....	3,324,592	136,505—	3.94—
Oct. 31, 1914....	3,461,097	326,570—	8.62—
Sep. 30, 1914....	3,787,667	425,664—	10.01—
Aug. 31, 1914....	4,213,331	54,742+	1.32+
July 31, 1914....	4,158,589	125,732+	3.12+
June 30, 1914....	4,032,857	34,697+	0.86+
May 31, 1914....	3,998,160	278,908—	6.98—
Apr. 30, 1914....	4,277,068	376,757—	8.09—
Mar. 31, 1914....	4,653,825	372,615—	7.42—
Feb. 28, 1914....	5,026,440	412,760+	8.95+
Jan. 31, 1914....	4,613,680	331,572+	7.74+
Dec. 31, 1913....	4,282,108	114,239—	2.59—
Nov. 30, 1913....	4,396,347	117,420—	2.60—
Oct. 31, 1913....	4,513,767	490,018—	9.79—
Sep. 30, 1913....	5,003,785	219,683—	4.24—
Aug. 31, 1913....	5,223,468	175,888—	3.03—
July 31, 1913....	5,399,356	407,965—	7.03—
June 30, 1913....	5,807,317	517,005—	8.18—
May 31, 1913....	6,324,322	654,440—	9.38—
Apr. 30, 1913....	6,978,762	490,194—	6.55—
Mar. 31, 1913....	7,468,956	187,758—	2.45—
Feb. 28, 1913....	7,656,714	170,654—	2.18—
Jan. 31, 1913....	7,827,368	104,796—	1.32—
Dec. 31, 1912....	7,932,164	79,281+	1.01+
Nov. 30, 1912....	7,852,883	258,502+	3.40+
Oct. 31, 1912....	7,594,381	1,042,874+	15.33+
Sep. 30, 1912....	6,551,507	388,132+	6.29+
Aug. 31, 1912....	6,163,375	206,296+	3.46+
July 31, 1912....	5,957,079	149,773+	2.58+
June 30, 1912....	5,807,346	56,363+	0.98+

Opens New Office.—The United Smelting & Aluminum Co., Inc., New Haven, Conn., manufacturer of aluminum ingots, alloys, rods, etc., has opened a branch office at 24 Stone street, New York. C. J. Wolfe, formerly connected with the Aluminum Co. of America and lately with the Cleveland Metal Products Co., of Cleveland, will have charge of this office.

Spring Meeting

Of American Iron and Steel Institute—Transfer to Active Membership

New York, March 14.—May 26 and 27 at the Waldorf-Astoria were definitely fixed upon as the time and place for the annual spring meeting of the American Iron and Steel Institute. These dates previously had been in view tentatively. The rough abstract of the program for the meeting also came up for preliminary attention.

One vacancy having occurred in the active membership list which has been full, the directors ordered the transfer of the name of Duke N. A. Blocet, metallurgical engineer of the Central Steel Co., Massillon, O., from the associate list. The principle settled upon for the transfers from the associate to the active list as vacancies come up, is that this should be done in the chronological order of the receipt of the applications for membership. As between two applications received on the same day, the changes will be made alphabetically.

Plans Large Foundry

Owing to the tremendous increase in the demand for ship castings, the American Ship Building Co. is planning the erection of a large new foundry at Lorain, O. Details of the new plant have not yet been worked out, except that it will have a capacity fully equal to that of the new Cleveland shop. The latter, situated at the foot of West Fifty-fourth street, is 120 x 180 feet, equipped with two Whiting cupolas, 66 inches and 84 inches in diameter, respectively, with a combined melting capacity of 18½ tons per hour. Negotiations are now under way with a prominent Pittsburgh firm of foundry engineers and it is expected that work will be commenced on the new Lorain plant at an early date.

The plant of the Canton Hughes Pump Co., Wooster, O., has been sold to L. A. Woodward, vice president of the Tod Steel Co., Youngstown, O., for $100,000. The former company has been in receiver's hands since Aug., 1915. The plant will be equipped for the manufacture of steel products in addition to pumps.

New Tube Plant

Will be in Partial Operation at Gary by the Middle of Next Year

New York, March 15.—Work is to be inaugurated immediately upon the new $25,000,000 tube plant which the National Tube Co. will build at Gary, Ind., and the works are expected to be in partial operation by the middle of 1917. The works will be the first of their kind to be established at Gary, and they will further round out the finishing capacity of that group of Steel Corporation units, which now embrace rails, plates, bars, sheets, fabricated products and under a recent authorization also will include tin plate. This will be the most extensive tube plant to be established by any company in the immediate Chicago district.

Chairman Gary's official statement in announcing the new project is as follows:

"We have decided to build and will promptly commence the construction of a first-class tube plant at Gary, Ind. It is estimated the improvements, including ore docks, ore yards, blast furnaces, converting mills, blooming mills, power station, water works, sheared plate mill, universal plate mill, continuous mills, lap plate mills, butt mills, job shops and all auxiliary departments, will cost $25,000,000. It is probable the plant will be built in two units, the first of which, it is hoped will be completed in about 14 months."

New Shipbuilding Plant

Shipbuilding facilities along the Delaware river are to be increased in the near future by the erection of a new plant by the Pennsylvania Shipbuilding Co., which has just been incorporated. The site of the new yard has not yet been announced, but it is understood that operations are expected to be inaugurated in August of this year. The company, according to its officials, has taken orders for six ocean-going vessels, all of which are for Norwegian owners and inquiries have been put before steel makers for the necessary material for these ships. Haakon E. Norbom of Germantown, Pa., is president of the company; Geo. S. Hoell, who has been secretary of the Norbom Engineering Co. for eight years, is secretary and treasurer; Chas. H. Moyer of Philadelphia and New York, is vice president and Henry Lysholm of Philadelphia, general manager. Mr. Lysholm has been connected with the New York Shipbuilding Co. of Camden since that yard was established.

1915 Lake Superior Ore Shipments

Official Figures Showing Tonnage Forwarded by Each Mine and Range—Independents Make Good Showing

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BY R. V. SAWHILL

IRON ore shipments from the Lake Superior district in 1915 aggregated 47,272,751 tons, as shown by the official figures just compiled by *The Iron Trade Review*. Of this total, 46,318,804 tons were moved by lake, all-rail shipments contributing 953,947 tons. The 1915 shipments showed a gain of 14,543,025 tons over 1914, when 32,729,726 tons were forwarded. This increase was 44.43 per cent of the total movement during 1914.

The lake movement in 1915 of 46,318,804 tons compares with 32,021,897 tons in 1914, a gain of 14,296,907 tons. The all-rail shipments last year of 953,947 tons compare with a rail movement of 707,829 tons in 1914, a gain of 246,118 tons.

The 1915 shipments have been exceeded in two other years only, 1912 with 48,221,546 tons and 1913, the record year, with 49,947,116 tons. The all-rail movement last year exceeded all but two years of the preceding decade. The record of all-rail shipments since 1905 is as follows:

	Gross Tons.		Gross Tons.
1915.....	953,947	1910.....	813,639
1914.....	707,829	1909.....	903,270
1913.....	876,638	1908.....	587,893
1912.....	785,769	1907.....	975,959
1911.....	662,719	1906.....	1,052,173

The independent ore mining companies shared more largely in the increase than the United States Steel Corporation. The independents forwarded 52.37 per cent of the total shipments, this record being the highest attained since the Steel Corporation was organized. In addition, it was the fourth successive year that the independent interests have shipped more than half of the total tonnage forwarded. Their percentage of the total in 1914 was 50.99, a fractional gain over 1913, when they forwarded 50.94 per cent, and over 1912, when they forwarded 50.54 per cent of the total. In one other year since 1905 the independents have shipped more than one-half of the season's tonnage, that being in 1910, when their percentage was 50.14. In 1907 and 1908, they shipped only 44 per cent, while in 1906 their percentage was 47. In 1909, they shipped 49.64 per cent and in 1911, 47.30 per cent. The strength of the independent ore interests is clearly revealed by their record of having forwarded more than one-half of the season's tonnage in five of the last six years.

Shipments from the mines formerly operated by the United States Steel Corporation under the "Hill lease", which was surrendered at the close of 1914, showed heavy declines during the year. The Arthur Iron Mining Co., which was formed to take over these properties, however, is rapidly perfecting its plans for shipping increased tonnages from these mines as well as new ones now under development.

The following table shows the shipments and percentage of the Oliver Iron Mining Co., the Steel Corporation's mining organization, for each of the last 10 years:

Year.	Gross Tons.	Percentage.
1915.....	22,518,613	47.63
1914.....	16,039,654	49.01
1913.....	24,502,244	49.06
1912.....	23,845,363	49.46
1911.....	17,282,499	52.70
1910.....	21,661,143	49.86
1909.....	21,397,866	50.36
1908.....	14,123,957	56.00
1907.....	22,710,898	56.00
1906.....	20,414,811	53.00
Total.....	204,497,048	50.64

Shipments from the Mesabi range in 1915 were 29,756,689 tons, against 21,465,967 tons in 1914, a gain of 8,290,722 tons. Its percentage of the total shipments was 62.95, against 65.62 in 1914; 68.15 in 1913; 66.46 in 1912; and 67.37 in 1911. The Gogebic range again ranked as the second largest shipper, forwarding 5,477,767 tons, against 3,568,482 tons in 1914, a gain of 1,909,285 tons. Its percentage in 1915 was 11.59, against 10.90 in 1914; 9.07 in 1913; 10.38 in 1912; and 7.94 in 1911. The Menominee range also showed a large increase in the tonnage forwarded, its shipments for 1915 being 4,982,626 tons, compared with 3,221,258 tons in 1914, a gain of 1,761,368 tons. Its percentage was 10.54 against 9.83 in 1914; 9.94 in 1913; 9.77 in 1912; and 11.93 in 1911. The Marquette range made a larger proportional gain, its shipments increasing to 4,105,378 tons in 1915, against 2,491,857 tons in 1914, a gain of 1,613,521 tons. Its percentage was 8.68, against 7.61 in 1914; 7.94 in 1913; 8.71 in 1912; and 8.64 in 1911. Vermillion range shipments were 1,733,595 tons, against 1,016,993 tons in 1914, a gain of 716,602 tons. Its percentage was 3.67, against 3.10 in 1914; 3.14 in 1913; 3.83 in 1912; and 3.32 in 1911.

The tonnage forwarded by the Gogebic was the largest since this range was opened. The previous record was made in 1912, when 5,006,266 tons were forwarded. The greatest tonnage ever forwarded from the Menominee was in 1905, when 5,109,088 tons were shipped. With this exception, 1915 shipments were the largest on record, slightly exceeding 1912 and 1907. The 1915 shipments from the Marquette have been surpassed in five other years.

The Cuyuna range in 1915 forwarded more than one million tons for the first time. The total shipments of the newest range last year were 1,136,113 tons, compared with 859,404 tons in 1914, a gain of 276,709 tons. This increase was slightly under that of the district as a whole, the Cuyuna's percentage last year being 2.40, against 2.62 in 1914; 1.47 in 1913; 0.63 in 1912; and 0.45 in 1911.

Seven mines shipped more than one million tons last year, the seven being the Burt, Canisteo, Hull-Rust, Mahoning, Morris and Sauntry-Alpena on the Mesabi and the Norrie Group on the Gogebic. In 1914, there were only four mines which reached this figure, they being the Leonard, Ma-

Comparative Shipments by Ranges, 1915-1914

	1915.	1914.	Increase.
Mesabi	29,756,689	21,465,967	8,290,722
Menominee	4,982,626	3,221,258	1,761,368
Gogebic	5,477,767	3,568,482	1,909,285
Marquette	4,105,378	2,491,857	1,613,521
Vermillion	1,733,595	1,016,993	716,602
Cuyuna	1,136,113	859,404	276,709
Mayville and Baraboo	80,583	105,765	*25,182
Totals	47,272,751	32,729,726	14,543,025
By lake	46,318,804	32,021,897	14,296,907
By rail	953,947	707,829	246,118

*Decrease.

Official Record of Shipments from Lake Superior District in 1915 and 1914

MESABI RANGE

	1915.	1914.		1915.	1914.		1915.	1914.		1915.	1914.
Adams	902,372	286,522	Franklin	81,126	28,885	Leonidas	732,777	232,416	Scranton	18,698	20,205
Adriatic	33,625	74,911	Genoa	426,329	476,972	Lincoln	239,142	207,251	Sellers	721,908	.....
Agnew	.....	108,558	Gilbert	.....	1,300	Lone Jack	21,560	.....	Seville	.....	3,908
Albany	317,030	227,766	Glen	253,398	.....	Mace	120,906	160,815	Shenango	939,674	546,519
Allan	.....	24,724	Grace	70,783	98,667	Madrid	.....	9,951	Shiras	50,707	5,206
Bangor	294,346	91,189	Graham	357,545	229,940	Mahoning	2,311,940	1,212,287	Sliver	252,347	197,041
Belgrade	241,525	155,012	Grant	189,749	111,443	Meadow	41,182	38,750	Spruce	638,230	488,870
Bennett	50,475	25,868	Hanna	27,395	83,940	Midway	1,106	.....	Stevenson	8,585	89,899
Bessemer	49,459	.....	Harold	86,340	489,042	Miller	247,188	297,379	Sullivan	20,048	.....
Biwabik	385,389	255,255	Harrison	239,075	154,732	Minnewas	33,478	5,798	Susquehanna	618,488	906,913
Brunt	11,805	.....	Hawkins	327,749	232,354	Minorca	116,591	85,541	Thorne	18,235	.....
Burt	1,043,607	213,433	Helmer	101,799	151,803	Missabe Mt.	668,060	5,347	Union	247,504	244,436
Canisteo	1,622,182	1,051,895	Higgins No. 1	219	1,102	Mississippi	.....	507,660	Uno North	.....	90,088
Cavour	.....	16,837	Hill	998,649	592,590	Mohawk	69,318	35,050	Uno South	21,557	945,840
Chester	6,150	.....	Hill Annex	.....	3,272	Monica	77,946	46,922	Utica	358,652	247,714
Chisholm	468,680	399,500	Holland	.....	11,048	Morris	1,167,421	365	Virginia (P. M. & Co.)	.....	31,233
Clark	439,461	392,530	Holman	845,898	497,276	Morton	58,214	339	Vivian	49,456	14,993
Commodore	561,438	372,796	Hudson	196,952	127,526	Myers	216,129	.....	Wacootah	55,645	36,839
Corsica	160,655	99,613	Hull-Rust	2,294,405	458,468	Norman	250,695	261,062	Wanless	49,212	3,808
Croxton	.....	982	Iroquois	.....	14,334	North Eddy	2,659	.....	Webb	.....	151
Cyprus	25,566	45,205	Itasca	126,003	.....	No. Harrison	169,948	.....	Weed	73,670	.....
Dale	116,336	423,711	Judd	334,685	95,416	Perkins	.....	18,182	Wentworth	851	.....
Deacon	59,925	87	Kinney	471,522	347,456	Pettit	158,397	120,868	White Iron	2,448	.....
Dean	360,372	.....	La Rue	24,911	24,700	Philbin	9,842	.....	Whiteside	31	242,996
Duncan	5,152	5,177	Laura	132,081	198,665	Prindle	24,100	12,392	Winifred	41,489	10,449
Eddy	16,889	.....	Leetonia	607,447	551,022	Quinn	91,007	49,251	Woodbridge	177,196	71,440
Elba	225,453	147,796	Leonard	197,599	2,686,285	Ruddy	50,003	15,215			
Fayal	774,096	673,643	Leonard-Burt	324,759	21,190	Sauntry-Alpena	1,455,825	1,131,255			
Fowler	.....	12,364	Leonard-Glen	66,327	2,135	Schley	101,891	16,386	Total	29,756,689	21,465,967

MENOMINEE RANGE

	1915.	1914.		1915.	1914.		1915.	1914.		1915.	1914.
Antoine (Clifford	.....	66,329	Chapin	384,654	340,722	(Ethel)	1,184	.....	Penn Iron Mining Co.	411,393	203,478
Aragon	302,275	188,765	Chatham	132,779	19,454	Gt. Western	35,759	.....	Pewabic	178,013	299,228
Armenia	.....	50,501	Chicagon	155,711	114,848	Hemlock	28,172	46,449	Ravenna	116,724	49,309
Baker	41,378	113,733	Commonwealth (Buckeye)	13,152	47,281	Hiawatha	93,455	91,369	Richards	92,808	7,069
Balkan	144,284	.....	Cortland	.....	15,318	Hilltop	.....	8,223	Riverton Group	262,382	176,233
Baltic	10,078	29,206	Cottrell	45	.....	Hollister	.....	16,429	Rogers	53,158	27,080
Bates	45,171	.....	Davidson	152,430	122,567	Homer	103,546	.....	Tobin	18,624	65,351
Bengal	39,615	5,539	Dunn	8,304	52,883	Indiana	52,570	.....	Tully	242,049	63,411
Berkshire	15,413	23,824	Ernst	124,765	40,437	James	121,655	73,832	Virgil	.....	5,913
Bristol (Claire)	378,786	172,034	Florence	23,118	680	Judson	.....	6,619	Wickwire	.....	25,329
Carpenter	284,088	51,146	Fogarty	27,718	15,329	Kimball	19,533	.....	Zimmerman	108,217	172,720
Caspian	479,084	279,379	Forbes	99,050	77,960	Loretto	68,806	45,449			
			Genesee			Michigan	112,680	9,471			
						Millie	.....	361	Total	4,982,626	3,221,258

MARQUETTE RANGE

	1915.	1914.		1915.	1914.		1915.	1914.		1915.	1914.
Adams (Amer. Min. Co.)	800	.....	Cleve. Cliffs Group	634,837	673,160	Maas	267,190	55,903	Queen Group	473,961	178,574
American (Sterling)	87,514	85,093	Gwynn	57,910	20,158	Mary Charlotte	203,922	69,056	Republic	215,182	52,562
Austin	.....	30,493	Holmes	17,373	.....	Milwaukee Davis	6,572	.....	Richmond	177,000	129,548
Beaufort (Ohio)	21,139	.....	Iron Mountain Lake	10,807	.....	Morris	80,546	29,063	Rolling Mill	130,902	98,010
Breitung (Hematite)	152,063	77,574	Jackson	56,026	20,241	Negaunee	480,521	247,484	Stegmiller	40,248	40,972
Cambria	159,443	132,814	Lake Angeline	19,513	128,073	Portland	97,476	45,324	Stephenson	243,458	93,795
Chase	39,059	19,708	Lake Super'r.	199,920	86,957	Princeton (Swanzey)	17,171	13,607	Volunteer	18,850	38,818
			Lloyd	195,975	123,211				Washington	.....	1,659
									Total	4,105,378	2,491,857

GOGEBIC RANGE

	1915.	1914.		1915.	1914.		1915.	1914.		1915.	1914.
Anvil	2,804	.....	Davis (Wisconsin)	5,434	.....	Newport	838,875	707,485	So. Chicago	1,274	.....
Ashland	112,932	133,250	Eureka	128,414	23,430	Norrie Group	1,408,516	984,242	Sunday Lake	136,211	54,327
Asteroid	13,468	135,119	Geneva	34,416	.....	No. Newport	32,356	.....	Tilden	99,516	114,767
Brotherton	107,244	47,662	Ironton	.....	51,138	Ottawa (Odanah)	196,486	106,260	Wakefield	651,302	313,050
Cary	203,819	68,464	Keweenaw	42,367	5,771	Palms	442,422	174,177	Yale (West Colby)	42,632	19,075
Castile	76,702	36,569	Mikado	1,044	2,094	Puritan	80,367	58,410			
Chicago	30,977	.....	Montreal	464,272	229,559	Royal	8,004	11,686	Total	5,477,767	3,568,482
Colby	315,913	291,947									

VERMILLION RANGE

	1915.	1914.		1915.	1914.
Chandler	104,628	.....	Soudan	77,636	74,972
Pioneer	453,099	282,559	Zenith	714,852	424,110
Savoy	76,672	74,541			
Section 30	177,143	85,943	Total	1,733,595	1,016,993

CUYUNA RANGE

	1915.	1914.		1915.	1914.
Armour No. 1	79,538	.....	Kennedy	216,655	179,885
Armour No. 2	303,280	283,565	Pennington	117,068	.....
Barrows	.....	47,350	Rowe	137,598	78,685
Cuyuna Mille-Lacs	36,847	51,292	Thompson	202,227	178,202
Iron Mountain	8,201	.....	Wilcox	34,383	.....
Ironton	316	40,425	Total	1,136,113	859,404

MAYVILLE-BARABOO RANGES

	1915.	1914.		1915.	1914.
Iron Ridge	.....	2,216			
Mayville	80,583	103,549	Total	80,583	105,765

	1915.	1914.
GRAND TOTAL	47,272,751	32,729,726

honing, Sauntry-Alpena and Canisteo, all on the Mesabi. In 1913, there were 11 mines which shipped more than one million tons, they being the Adams, Canisteo, Fayal, Genoa, Hull-Rust, Leonard, Mahoning, Sauntry-Alpena and Uno South on the Mesabi and the Norrie Group and Newport on the Gogebic. In 1912, 11 mines shipped more than a million tons, they being the Canisteo, Dale, Genoa, Hill, Hull-Rust, Leonard, Mahoning, Sauntry-Alpena and Uno South on the Mesabi, the Norrie Group on the Gogebic and the Cleveland-Cliffs Group on the Marquette. Six attained that figure in 1911, they being the Canisteo, Dale, Hill, Leonard, Mahoning and Sauntry-Alpena, all on the Mesabi. The nine which shipped more than one million tons in 1910 were the Adams, Burt, Canisteo, Fayal, Hull-Rust, Mahoning and Morris on the Mesabi, and the Newport and Norrie Group on the Gogebic.

The Mahoning mine was the leading shipper last year, forwarding 2,311,940 tons, and slightly exceeding the great Hull-Rust mine with shipments of 2,294,405 tons. The Leonard was the leading shipper in 1914. The Hull-Rust has been the leading shipper in six of the last nine years, the Hill leading in 1911.

The following new mines shipped in 1914:

On the Mesabi: Chester, Midway, Philbin, Sullivan and Weed, of the Oliver Iron Mining Co.; Dean, Eddy, Itasca and North Eddy, of the Tod-Stambaugh Co.; Thorne and Wentworth, of the Arthur Iron Mining Co.; and North Harrison, of Butler Bros.

On the Menominee: Balkan, of Pickands, Mather & Co.; Bates, of the Bates Iron Co.; Cottrell, of the Oliver Iron Mining Co.; and Homer, of the Wickwire Steel Co.

On the Gogebic: North Newport and South Chicago, of the Oliver Iron Mining Co., The latter mine was prospected in 1904, the property being surrendered at that time.

On the Marquette: Holmes, of the Cleveland-Cliffs Iron Co.; and Iron Mountain Lake, of the Jones & Laughlin Ore Co.

On the Cuyuna: Iron Mountain, of the Iron Mountain Mining Co.; and Wilcox, of the Canadian-Cuyuna Iron Mining Co.

These 22 new shippers in 1915 compare with 16 mines opened in 1914; 20 in 1913; 13 in 1912; 12 in 1911, and 16 in 1910. Twelve of the new mines shipping last year are located on the Mesabi, four on the Menominee, and two each on the Gogebic, Marquette and Cuyuna. Shipments from new mines totaled 1,203,213 tons in 1915, compared with 677,182 tons in 1914; 831,567 tons in 1913; 361,904 tons in 1912; 1,769,423 tons in 1911, and 1,734,044 tons in 1910.

Several mines which had been idle for years forwarded ore in 1915. The Indiana mine on the Menominee, which last shipped in 1886, joined the active list last year. On the Gogebic, the Oliver Iron Mining Co. forwarded ore from the Chicago and Davis (Wisconsin) mines, last active in 1903 and 1905, respectively. On the Mesabi, the Lone Jack of the Oliver company resumed. It was formerly part of the Virginia Group and has been idle for some years.

Shipments from Canadian mines in 1915 were as follows: Helen, of the Algoma Steel Corporation, 220,771 tons; Magpie, of the Algoma Steel Corporation, 107,560 tons; Moose Mountain, of Oglebay, Norton & Co., 40,444 tons. The Helen shipped 80,860 tons in 1914; 42,550 tons in 1913; 48,838 tons in 1912; 128,628 tons in 1911, and 115,790 tons in 1910. The Moose Mountain shipped 29,457 tons in 1914; 102,238 tons in 1913; 39,061 tons in 1912; 6,678 tons in 1911, and 72,470 tons in 1910. The Magpie shipped 98,070 tons in 1914 and 19,934 in 1913. The shipments for the Canadian mines are not included in the total for Lake Superior ore shipments.

There are 209 mines which shipped in 1915, compared with 196 in 1914; 223 in 1913; 194 in 1912; 184 in 1911, and 196 in 1910. Of those shipping last year, the Mesabi had 97, Menominee 40, Marquette 28; Gogebic 26, Cuyuna 10, Vermillion 7, and Mayville and Baraboo 1. In 1914, the Mesabi shippers numbered 94, Menominee 41, Marquette 25, Gogebic 21, Cuyuna 7, Vermillion 6 and Mayville and Baraboo 2.

The following table shows the average shipments of all of the mines on the six leading ranges and of the whole Lake Superior district for 1915 and 1914, in gross tons:

AVERAGE MINE SHIPMENTS.

	1915.	1914.
Mesabi	306,769	228,361
Vermillion	247,656	169,499
Gogebic	210,683	169,928
Marquette	146,621	99,674
Menominee	124,566	78,567
Cuyuna	113,611	122,772
Lake Superior district	226,186	166,988

Shipments by Ports and All-Rail

Gross Tons

	1915.	1914.	1913.	1912.	1911.	1910.
Escanaba	5,649,289	3,664,451	5,399,444	5,234,655	4,278,445	4,959,726
Marquette	3,099,589	1,755,726	3,137,617	3,296,761	2,200,380	3,248,516
Ashland	5,146,772	3,363,419	4,338,230	4,797,101	2,429,290	4,094,374
Two Harbors	8,642,942	5,610,262	10,075,718	9,370,969	6,367,537	8,271,177
Superior	8,342,793	11,309,748	13,788,343	14,240,714	9,920,490	8,414,799
Duluth	15,437,419	6,318,291	12,331,126	10,495,577	6,934,269	13,640,166
Total by lake	46,318,804	32,021,897	49,070,478	47,435,777	32,130,411	42,628,758
Total by rail	953,947	707,829	876,638	785,769	662,719	813,639
Total	47,272,751	32,729,726	49,947,116	48,221,546	32,793,130	43,442,397

Shipments by Ranges

Gross Tons

	1915.	1914.	1913.	1912.	1911.	1910.
Marquette	4,105,378	2,491,857	3,966,680	4,202,308	2,833,116	4,392,726
Menominee	4,982,626	3,221,258	4,965,604	4,711,440	3,911,174	4,237,738
Gogebic	5,477,767	3,568,482	4,531,558	5,006,266	2,603,318	4,315,314
Vermillion	1,733,595	1,016,993	1,566,600	1,844,981	1,088,930	1,203,177
Mesabi	29,756,689	21,465,967	34,038,643	32,047,409	22,093,532	29,201,760
Cuyuna	1,136,113	859,404	733,021	305,111	147,431	.....
Mayville and Baraboo	80,583	105,765	145,010	104,031	115,629	91,682
Total	47,272,751	32,729,726	49,947,116	48,221,546	32,793,130	43,442,397

Will Erect Steel Mill

The Chattanooga Steel Co., recently incorporated, has completed plans for the erection of a steel mill at Chattanooga, Tenn., to cost approximately $2,000,000. W. R. Miller Co., the House building, Pittsburgh, formerly the Forter-Miller Co., engineer and manufacturer of gas producers, has been awarded the contract for erecting and superintending the construction of the plant. The company will manufacture sheet bars, tin plate and cotton ties. A contract for a 34-inch blooming mill has been awarded to the National Roll & Foundry Co., Avanmore, Pa., and the Westinghouse Electric & Mfg. Co. has been awarded contracts for electrical equipment Ten standard tin plate mills and one cotton tie mill, contracts for which have not been awarded, will be installed, in a continuous mill building, 250 x 2,600 feet. Two 75-ton open hearth steel furnaces will be installed, and provision will be made for the addition of four more furnaces.

The Bruce Sewing Machine Co, Springfield, Ill., has increased its capital stock from $100,000 to $200,000.

Graphic Record of Shipments by Ranges for the Past 26 Years

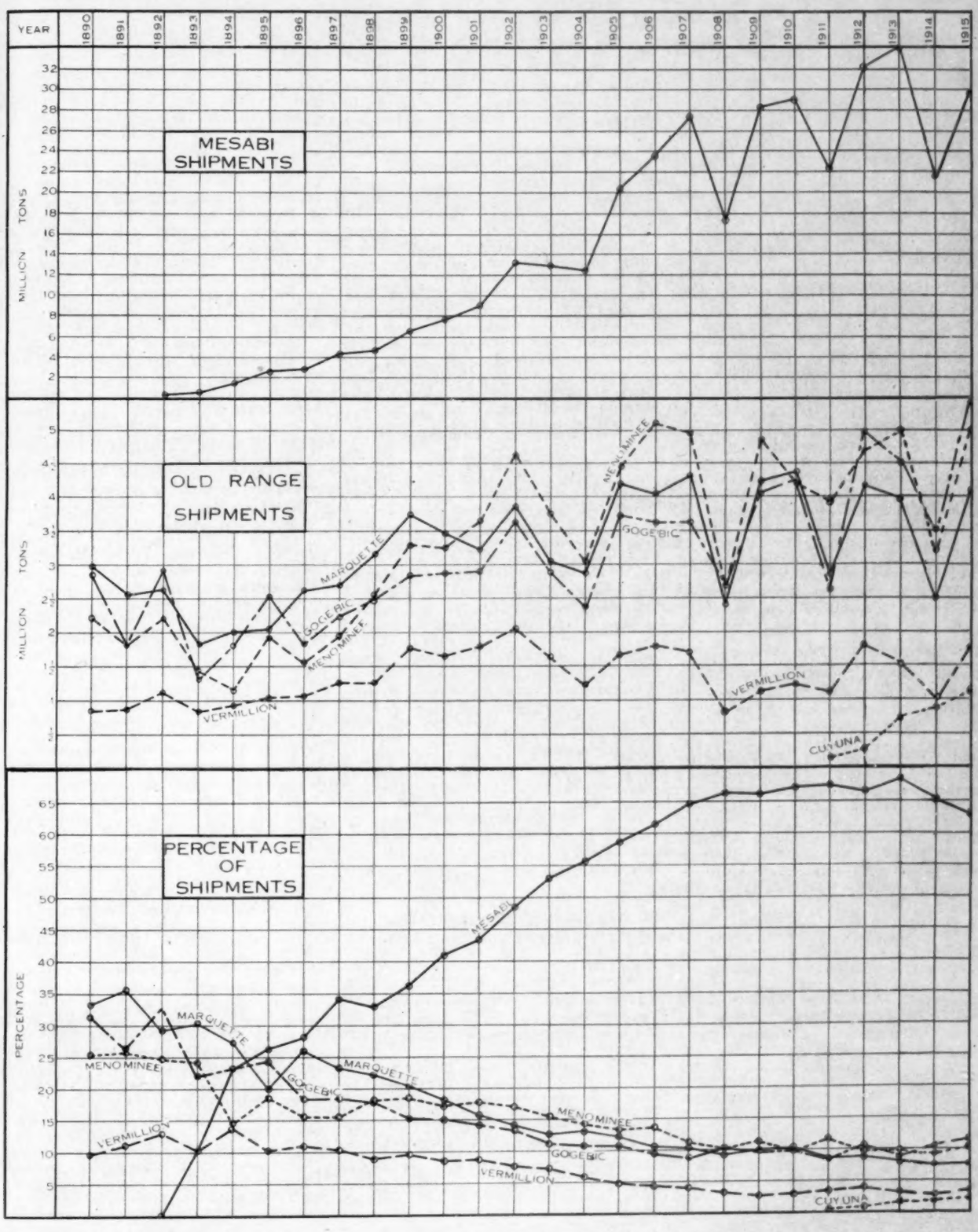


CHART SHOWING SHIPMENTS MESABI RANGE, 1892-1915; OLD RANGES, 1890-1915; PERCENTAGE OF SHIPMENTS OF ALL RANGES, 1890-1915.

News of Employers and Employes

Report of the Mahoning County Grand Jury—Strike in New England Settled—Other Labor Troubles

THE indictments reported last week by the grand jury of Mahoning county, O., briefly reported in *The Iron Trade Review* last Thursday, charge that the Youngstown Sheet & Tube Co., Republic Iron & Steel Co., United States Steel Corporation, the Brier Hill Steel Co., the Youngstown Iron & Steel Co. and Elbert H. Gary willfully and unlawfully combined and confederated their capital, skill and acts, and did unlawfully and willfully agree, conspire and confederate for the purpose of creating and carrying out restriction in trade, business and commerce by controlling prices of iron and steel products and the rates and wages of employes. The part of the report relating to the recent labor troubles is as follows:

So many various elements entered into the widespread and overwhelming lawlessness in East Youngstown on the night of Jan. 7 that we would not feel justified in attempting to charge the commission of all these crimes on that night to any one particular cause. The evidence has developed that Friday, Jan. 7, 1916, was the first day of the Greek Catholic Christmas holidays.

Refused to Close Saloons

Great dissatisfaction existed among the men employed by the various steel industries of the valley, not only among those employed in the performance of unskilled or "common" labor, but among many of the better paid wage-earners as well. During all day and night of Thursday, Jan. 6, 1916, thousands of men were congregated at the various gates of the plants of the Republic Iron & Steel Co. in Youngstown and the Youngstown Sheet & Tube Co. in East Youngstown, and particularly at the gates of the latter plant. So far as we have been able to adduce from the evidence, neither the mayor nor the police force of East Youngstown made any honest effort whatever to disburse the mob at the gates of the Youngstown Sheet & Tube Co. in East Youngstown; whereas in the city of Youngstown the mobs were held almost entirely within the bounds of the law by police officers who were in no greater number than that of the officers who could have been assembled for like duty in the village of East Youngstown. We find further that on Thursday night, Jan. 6, 1916, various protests were made to W. H. Cunningham, mayor of the village of East Youngstown, to close the saloons of the village, but that he failed and refused to do so, until about four or four-thirty p. m., Jan. 7, 1916, at which time the members of the mob were already so intoxicated and riotous that very little, if any, advantage could be derived from such closing order. Furthermore, we find as a matter of fact, that Mayor Cunningham assured the peace officers of both state and county that he had the matter within his control during all of Thursday, Thursday night and Friday until four p. m. of the latter day; and generally we find that the executive officers of the village of East Youngstown, including the mayor, council and police officers of the village, indicted, not only during the riots of the 6th and 7th of January, 1916, but for some time prior to those dates, such inefficiency and disregard for law and order and for legal procedure that they, and each of them, are entirely unfit and unworthy of filling the honorable positions which they, and each of them, then occupied as officers of the village.

Guard is Criticized

During the most serious time of the riot on Friday night, one of the guards of the Youngstown Sheet & Tube Co., who, with some seven or eight other guards of the company, was a member of the local Ohio National Guard, came to the armory of the Ohio National Guard at Youngstown where there were assembled at that time upon order of the captain of the Ohio National Guard some 12 or 15 members. From the membership of the Ohio National Guard thus assembled, this guard of the Youngstown Sheet & Tube Co., without the permission of any one in authority, but by virtue of an office held by him in the Ohio National Guard, ordered ten members of the Ohio National Guard to accompany him to the property of the Youngstown Sheet & Tube Co. and assist him in the protection of the company's property, and also took from the armory a large amount of government ammunition. While there was no intent on the part of this company guard to steal the government property thus taken, or to leave the public entirely without the protection of the local Ohio National Guard, yet, we believe that such conduct on the part of the company guard is decidedly censurable, especially in view of the fact that it made it impossible for either the sheriff or the captain of the local Ohio National Guard to mobilize sufficient soldiers to make an attempt at suppressing the riot, which at this particular time involved the crimes of arson, burglary, looting, and other felonies.

Shots at the Bridge

We find from the evidence adduced before us that while one shot was fired from one of the mob assembled around the East Youngstown gate and bridge of the Youngstown Sheet & Tube Co. about 2:30 p. m., Friday, Jan. 7, 1916, the shots which precipitated the extreme acts of violence, lawlessness and crime which were committed on the night of Friday, Jan. 7, 1916, were shots fired by the guards of the Youngstown Sheet & Tube Co. from the company's bridge; and while it is true that there was occasion on the part of the guards to fire shots at that portion of the crowd which was assembled directly in front of the company's gate and who were from all appearances about to break down the gate, yet, the action of a number of the company's guards in firing into the mass and crowd of people to the east and west of the bridge, some of whom were innocent of any riotous intent, can only be accounted for by the fact that the guards who so shot to the east and west from the bridge, were not all of such standard as should have been trusted by the company with the use of dangerous firearms under the conditions existing about them at that time.

We have been unable to find any proof of any direct connection with any foreign government and any influence that was brought to bear upon the rioters to commit the various acts of crime which were committed that night, but we do find that without question the men assembled in the riotous mob, already greatly under the influence of liquor and filled with a deep dissatisfaction of the conditions existing as between them and their employers in the steel industries, were appealed to and inflamed by the feeling of loyalty for their foreign governments, which governments they considered would be injured by the manufacture and sale of the munitions of war then being made by the industries with which the men were then employed, although the evidence against such agitators has to date not been sufficiently direct as to warrant indictments against them charging the inciting of the actual riots.

Evidence Kept Secret

We find, however, that there is an underlying cause back of not only the strike and the dissatisfaction prevailing among the men prior to the strike, but of the riot itself, a cause which will be shown upon the trial of some of the corporations and individuals against whom charges have been made by this jury as shown by the indictments returned herewith. This evidence is not of such nature as should be exposed by this report, but is such as will undoubtedly be uncovered to the satisfaction of the court and of the public in further legal proceedings in connection with this investigation. We are firmly of the opinion that not only will this evidence show a lawless condition of affairs surrounding the labor conditions existing in and about the steel industries of this valley, but will also indicate an absolute disregard on the

part of certain corporations and individuals indicted by us, either of the rights of, or justice to, the laboring class, or of the public generally.

Statements in Denial.

Statements are made by executives of the various concerns indicted denying absolutely the allegation of any sort of a "trust" either to control wages or prices.

Judge Gary, at New York, thus commented upon the indictment:

"There are no facts to justify the indictment returned by the Mahoning county grand jury against the United States Steel Corporation or Carnegie Steel Co. or any of the officers, or so far as I know, against any of the other companies. The indictment is an outrage—a travesty."

Chairman John A. Topping, of Republic Iron & Steel Co., declared he is astonished beyond measure. He said he is absolutely without knowledge of any attempt toward conspiracy by either officials of the Republic Iron & Steel Co. or others.

President Jas. Campbell, of the Sheet & Tube Co., stated emphatically:

"If the facts are as given, both charges are untrue. The United States Steel Company fixed its own wage scale and announced it before the Youngstown Sheet & Tube Co. knew anything about it. We never had any understanding on these questions with other local manufacturers."

Nine Strikes Ended

The nine strikes of machinists which have been in progress in Hartford, Conn., many months have been called off by the union, ostensibly so as to allow its representatives to secure employment in the different shops and place them in a position to organize them more thoroughly in preparation of the 8-hour campaign to be inaugurated in the spring throughout the country. About 4,000 men were involved. The largest number of strikers was at the Pratt & Whitney Co., where 1,500 men were out. The other concerns were the Hart & Hegeman Co.; Taylor & Fenn; Arrow Electric Co.; Jewell Belting Co.; Rhodes Mfg. Co.; Atlantic Screw Co.; Billings & Spencer, and the Colt's Patent Firearms Mfg. Co. It is said unofficially that none of the demands of the men which include increased pay, were granted. The demands in every case were for an 8-hour day with the customary provisions for time and one-half for overtime, double time for Sundays and holidays, and the re-adjustment of piece-work prices to meet the change in day wages. Labor officials said at the time of the Pratt & Whitney strike that 60 per cent of the strikers were union men. The strikers lost about $150,000 in wages and the strike cost the manufacturers as much. About 750 strikers left the city for work in other places. The Capewell Horse Nail Co., strike which is still on, began in May, and it brings the total number of strikers up to about 2,500.

Metal Trades Election

At the annual meeting of the Cincinnati branch of the National Metal Trades Association, which was held at the Hotel Sinton March 3, the following officers were elected: President, A. H. Tuechter, of the Cincinnati Bickford Tool Co.; vice president, J. B. Doan, of the American Tool Works Co.; secretary, J. A. LeBlond, of the R. K. LeBlond Machine Tool Co.; treasurer, William Emmes, of the Boye & Emmes Machine Tool Co.

Labor Legislation

The annual summary of labor legislation in the United States, published by the U. S. Bureau of Labor Statistics of the department of labor, which appears as its Bullentin 186, covers the activities in this field during 1915, of 45 states, two territories, and the federal congress. With three exceptions, Kentucky, Maryland and Mississippi, every state in the union held a legislative session, regular or extra, in 1915, and of these, all but two, Louisiana and Virginia, enacted laws of special interest to labor. The bureau's report reproduces the text of all these labor laws and presents a concise revue of each class of legislation. The workmen's compensation laws are omitted, having been published separately in the bureau's recently issued Bulletin 185.

Aside from the enactment of workmen's compensation laws, perhaps the most significant feature of the legislation of the year is the growth of the industrial commission plan, uniting in one authority the administration of workmen's compensation, factory inspection, and other labor laws. This plan was adopted in 1915, in Colorado, Indiana, Montana, Nevada, and New York.

Especially notable in the legislation of the year was the attention given to the subject of unemployment and public employment offices. In Illinois a commission on unemployment was established to report at the next legislative session. Public employment offices were provided for in California, Idaho, Iowa, New Jersey, and Pennsylvania, and provision was made for the extension of the system of public employment offices in Illinois, Michigan and Oklahoma. The licensing and supervision of private employment offices were provided for in seven states, while Idaho prohibited the maintenance of private employment agencies operated for profit.

In the field of safety provision, the most detailed enactments were those formulated by the Industrial Commission of Wisconsin and the Industrial Boards of New York and Pennsylvania. The rules and orders of these bodies indicate an intimate knowledge of the conditions to be met which it is impossible for an ordinary legislative committee to procure.

Laws to regulate the giving of clearance cards or statements of cause of discharge were enacted in three states, California, Indiana, and Oregon, while in two states, California and Nevada, the right is given the employe by law to hear and answer charges brought by "spotters" before being discharged on their evidence.

N. M. T. A. Meetings

The fourteenth annual meeting and banquet of Worcester branch, National Metal Trades association, was held in Worcester, Mass., Friday night, the following officers being elected: President, Jerome R. George, of the Morgan Construction Co.; vice president, Herbert E. Jennison, of the Blake Pump & Condenser Co., Fitchburg; treasurer, Arthur W. Beaman, of the Stockbridge Machine Co.; executive board, Prof. George I. Alden, of the Norton Co., Albert E. Newton, of the Reed-Prentice Co., Albert J. Gifford, of the Leland Gifford Co., and Edwin C. Harrington, of the Harrington & Richardson Arms Co. The retiring president, John W. Higgins, of the Worcester Pressed Steel Co., was made an honorary member. The speakers at the banquet were James A. Emery, Washington, counsel for the National Association of manufacturers, H. H. Rice, Indianapolis, president of the National Metal Trades Association, Hon. John N. Cole, Andover, Mass., former speaker of the Massachusetts house of representatives, and Ralph D. Redfern, Fitchburg, Mass., field secretary of the associated industries of Massachusetts.

The ninth annual banquet of the Rhode Island branch, National Metal Trades association, was held at the Narragansett hotel, Providence, March 9, 75 members attending.

Iron and Money: Fact and Comment

Wall Street Has a Cheerful Week—Financing Shell Orders in Canada Insures Large Contracts

THE stock market started last week with a decided upward tendency and the optimistic sentiment dominated throughout the week. In the early part of the week, the news in regard to the diplomatic negotiations with Germany was not at all alarming, and later, when it was announced that Villa had made a raid in the United States and our government would pursue him, there was not much excitement on Wall street. Although it was evident Saturday that the United States might find the cleaning up of Mexico a rather difficult job, the market continued cheerful. General news from the great industries of the country was encouraging.

Quotations at the close of business March 11 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Mar. 11.	Net Change.
American Can	60⅝	+ 2
American Can, prfd.	111½	+ ½
Amer. Car & Fdy.	70	+ 3½
Amer. Car & Fdy., prfd.	119½	+ 1⅜
American Locomotive	73	— 4½
American Locomotive, prfd.	101⅜	+ ½
American Steel Foundries	53	+ 3
Baldwin Locomotive	106⅛	+ 4⅞
Bethlehem Steel	488½	+20½
Bethlehem Steel, prfd.	132	+ 2
Colorado Fuel & Iron	44¼	+ 2⅝
Continental Can	83	+ 2¾
Continental Can, prfd.	108	+ 2
Crucible Steel	84½	+11⅜
Crucible Steel, prfd.	113⅝	+ 2⅛
General Electric	169½	+ 2½
International Harv. of N. J.	109¾	+ ½
Internat'l Harv. of N. J., pr.	114	.....
International Harv. Corp.	68⅛	— ⅛
Lackawanna Steel	77¼	+ 2¼
Nat'l Enamel'g & Stamp. Co.	25⅜	+ 1⅛
Nat. En. & Stmp. Co., prfd.	97	— ½
Pressed Steel Car	55	+ 4⅞
Pressed Steel Car, prfd.	102	+ ⅛
Pullman Palace Car	162⅞	+ ⅜
Republic Iron & Steel	52¼	+ ¾
Republic Iron & Steel, prfd.	111⅜	+ ⅞
U. S. Cast Iron Pipe Fdy.	21¾	+ 4
U. S. C. I. P. & Fdy., prfd.	50	+ ⅛
United States Steel	83⅝	+ 2⅛
United States Steel, prfd.	116⅜	+ ⅛
Westinghouse Mfg.	65	+ 2¼

The following table shows changes in maximum quotations of stocks not listed on the New York exchange:

	High Mar. 10	High Mar. 3
American Radiator	398	396
American Ship Building	41	39⅛
Cambria Steel	81⅛	81
Chicago Pneumatic Tool	67¾	69½
LaBelle Iron Works	52⅛	50
Lake Superior Corpn.	11	11½
Pennsylvania Steel	.....	70
Stewart-Warner Speed. Co.	87½	86½
Warwick Iron & Steel	10¾	10½
Westinghouse Air Brake	139	138½
Westinghouse Elec. & Mfg.	65⅝	65

Will Hold Smoker.—The Pittsburgh Foundrymen's Association will hold a smoker in the English room of the Fort Pitt hotel, March 20. W. W. Sanderson of the Carborundum Co., chairman of the entertainment committee, has prepared an interesting program.

Financing Shell Orders

The financial arrangements connected with further shell orders for Canadian industrial concerns are practically completed. The Canadian Bankers' Association has agreed to the proposal of Sir Thomas White, minister of finance, looking to cooperation in the extension of the credits which are necessary, and an official announcement to that effect may be expected at once. The orders which the British government is placing are not in bulk, but are coming in every day and are being placed as they are received, though in each instance competitive bids are asked. During the present year it is estimated that the total new orders will aggregate a hundred million dollars, but they will be spread out rather than awarded in one lot. These contracts are being placed with firms already in the business and having the necessary machinery and equipment which is essential to it. The contracts cover all sizes of shells as well as boxes, cartridge cases, primers and the many parts which enter into modern munitions. The orders are not being made public, but they are all in the nature of additional contracts for those already in the business. To the extent indicated, there is no doubt of the business being secured, especially as the bankers have agreed to arrange the necessary credits for payment by the imperial government. The only element of anxiety is at the possible delays in delivery.

Many Lose Money

Joseph A. Sedgwick, treasurer of the Fore River Shipbuilding Corp., Quincy, Mass., recently told the Massachusetts legislative committee on federal relations that, contrary to popular opinion, over 50 per cent of the munition makers are losing money on war orders, owing to the intricate and special knowledge and conditions required to make guns and shells, and there are only about 300 establishments making war munitions in this country today. He said that it takes from six to 10 months to prepare a plant for the making of shells, which shows the necessity for preparedness for this country. His plant started making shell casings last May, and to prepare his plant required the installation of all special machinery, 80 per cent of which was designed and constructed under his direction.

To Make Distribution

The Hydraulic Pressed Steel Co., Cleveland, will make two distributions to stockholders, one a 50 per cent dividend, the other in the form of issuance of stock now in the treasury at $150, a price substantially under the market. The company's present authorized capital stock, of which $155,000 remains to be issued, and the stock dividend of 50 per cent will call for an additional $500,000 of stock which will make the total outstanding $1,500,000. Shareholders will meet April 12 to act on the recommendation of directors, who met yesterday. The company's gross business in 1916, exclusive of the output of munitions, will amount to between $3,000,000 and $4,000,000, it is officially stated. Hydraulic stock sold above 300 recently.

Makes Report

The annual report of the American Steel Foundries indicates that, taken as a whole, 1915 was an even poorer year for this company than 1914. However, the tide turned late in the year and the company has a bright outlook for 1916. It has on its books at present more tonnage than ever before in its history and at improved prices. It started 1915 with four plants shut down and with less tonnage on its books than at any time since 1909. Taking the average for the year, the plants operated at 46.5 per cent, as against 50.4 per cent for 1914. Gross sales were $10,024,870, as compared with $11,125,091 in 1914; net profit after interest charges amounted to $264,156, as compared with $231,481 in 1914. The deficit actually shown for the year was $219,574, as compared with $575,161 in the previous year. The outstanding feature of the report is in connection with the company's debt. Interest charges were reduced materially in 1915 from 1914, while the sinking fund and bond retirement were heavier, which further strengthens the company's financial position. No dividends were paid last year.

MEN OF THE IRON TRADE

Who they are **Where they are** **What they are doing**

H. F. Wardwell has been promoted from home office manager to general sales manager of the Detroit Steel Products Co., succeeding P. A. Smith, resigned.

W. F. Rosen of Landenburg, Thalman & Co., New York City, has been made a director of the New York Air Brake Co., the board having been enlarged from seven to eight members.

George L. McKesson, former director of public schools in Toledo, O., resigned his position which pays $4,000 a year salary, to devote his entire time and attention to the affairs of the Haughton Elevator & Machine Co., of which he is vice president.

Charles T. Walker, formerly master mechanic for the American Bridge Co., at Gary, Ind., has been made assistant general manager of this plant, succeeding P. W. Seyl, who has been promoted to manager of the Lassig plant at Chicago.

Samuel G. Allen has been made president of the Franklin Railway Supply Co., New York City, and Joel S. Coffin, former president, has become chairman. Mr. Coffin has been prominently identified with the syndicate which recently took over the Lima Locomotive Corporation, Lima, O.

Wilbur J. Watson and Wendell P. Brown, engineers, associated as W. J. Watson & Co., Leader-News building, Cleveland, have organized a department of inspection and tests in connection with their consulting and designing work and are prepared to furnish service in connection with steel mill inspection and tests, steel shop inspection and the laying out of building work.

H. G. Clopper, general sales manager of the New Jersey Zinc Co., 55 Wall street, New York, has announced the appointments of E. V. Peters as assistant general sales manager and A. H. Peck as sales manager to replace Alfred W. Dodd. The latter resigned to become New York sales agent for the Granby Mining & Smelting Co. All of these changes became effective March 1.

A. H. Peck, on March 1 resigned as sales manager of the Mineral Point Zinc Co. to take over the same duties for the New Jersey Zinc Co. Mr. Peck now makes his headquarters at the main office of the latter company, 55 Wall street, New York. Mr. Peck's successor is J. H. Williams, who now is in charge of the Mineral Point Zinc Co.'s sales offices in the Marquette building, Chicago.

Fred F. Graham, secretary of the Lackawanna Steel Co., has been made a director, succeeding the late John G. McCullough.

With the exception of Hudson Maxim, president, an entirely new board of directors has been elected for the Maxim Munitions Corporation. The new members are W. W. Williams, treasurer, and M. J. Budlong, vice president, respectively, of Gaston, Wigmore & Williams, Inc., New York; J. W. O'Bannon, president of the International Rubber Co. and an officer of the O'Bannon Corporation, which has a large contract for gun cotton with the Russian government; George G. Bourne, of Babcock, Wilcox & Co., and Herbert Lowell Dillon, of Eastman, Dillon & Co., bankers. Esmond P. O'Brien, director of the Garfield National Bank, New York, was elected vice president.

Matthew J. Scammell, who has been superintendent of blast furnaces of the Maryland Steel Co., Sparrows Point, Md., has been made general superintendent of the company. This is a newly created position arising from the recent appointment of Quincy Bent as general manager of the Steelton works of the Pennsylvania Steel Co. Mr. Bent previously had held the title of assistant to the president of the Maryland Steel Co. Mr. Scammell was born at Trenton, N. J., Jan. 19, 1883, and was educated at Lafayette College, where he took the degree of bachelor of science and chemistry. He is a member of the Chi Phi collegiate fraternity and of the American Iron and Steel Institute.

The Snyder Electric Furnace Co., of Chicago, recently added to its staff of metallurgical engineers Robert M. Keeney, who will be in charge of all development work. Mr. Keeney has had a broad experience in electric furnace research, covering the production of iron, steel and ferro-alloys in the electric furnace, and the electric smelting of lead, copper and zinc ores. His work has been especially directed toward the production of ferro-alloys and electric smelting. Before his connection with the Snyder Electric Furnace Co., Mr. Keeney was electrometallurgist of the United States Bureau of Mines at Pittsburgh, Pa., and Salt Lake City, Utah; mill superintendent of the Baker Mines Co., Cornucopia, Ore., and metallurgist of the Standard Chemical Co., Canonsburg, Pa.

A number of changes have taken place at the Remington Arms & Ammunition Co., and the Union Metallic Cartridge Co., Bridgeport, Conn. C. C. Tyler, vice president of the new combination of the Remington interests, became works-manager of the Union Metallic Cartridge Co. Major Walter G. Penfield, U. S. A., retired, who has been general manager of the Remington interests there becomes works-manager of the Remington Arms & Ammunition Co., shops north of Barnum avenue only. Major W. A. Phillips, who succeeded Frank O. Hoagland as works manager of the Union Metallic Cartridge Co. last year, is no longer connected with the company. Ending their employment with munitions plants also, are Major Dickinson and Capt. D. C. Seagraves, the latter of Fairfield, Conn. Jerome Orcutt, under the new regime, is works-manager of the Union Metallic Cartridge Co., plant at Swanton, Vt.

President Mark Workman, of the Dominion Steel Corporation, has appointed D. H. McDougall as general manager. Mr. McDougall is a Nova Scotian 36 years of age and has been employed in various capacities in connection with the Dominion Iron & Steel and Dominion Coal companies. During the construction period of the Dominion Iron & Steel Co., he was attached to the engineering staff, and subsequently spent two years in the study of mining and steel works engineering in the United States. On returning to Nova Scotia, he became superintendent of the iron ore mining operations of the company, and in 1909 was appointed assistant general manager of the Coal company, of which in 1912 he became general manager. It is believed that the policy of placing the steel plant, the iron mines and the collieries under one executive control will secure greater economy and efficiency in the management, than by treating them as separate interests.

Business News of Nation's Capital

Interesting Facts Developed at Hearing in Regard to Freight Congestion—Hard Nut to Crack

Bureau of *The Iron Trade Review*,
206 Corcoran Bldg.,
Washington, D. C., March 7.

Steps are expected to be taken as quickly as possible by the interstate commerce commission to do what it can to relieve the serious condition growing out of the freight congestion at New York and other Atlantic terminals. The hearing held here last week, attended by about 100 railroad representatives and shippers, resulted in bringing out the various angles of the situation, with many suggestions, some of them conflicting, as to the remedy that may be applied. Chairman C. C. McChord of the commission made it plain that, although the commission has been flooded with recommendations from all sides, it has no jurisdiction or power relating to the physical handling of traffic, the operation of the railroads, or providing terminal facilities.

The commission had taken up the question, he said, to familiarize itself with the condition, and he told why the commission had refused to authorize the carriers to file on short notice tariffs which would bring about drastic advances in storage charges and result in abrupt withdrawal of privileges which the carriers had voluntarily established and have maintained for many years. He also called attention to the manifest injustice of allowing, even in times of stress like the present, the western carriers to be deprived of their equipment to such an extent that it would be almost impossible for them to transact business. Helpful suggestions were asked for from the railroad representatives and shippers.

It may be that the proposal to create an embargo committee of some character under the supervision of the commission will be acted upon. This plan appears to be about the only one suggested that received favorable consideration of both shippers and railroad representatives.

Exceptionally interesting views were set forth before the commission by A. F. Mack, traffic manager of the United States Steel Products Co., and were considered to be representative of the position of most of the shippers. It was suggested by him that contracts should be made with steamers by all shippers. Claiming that a large part of the present difficulty is due to the railroads, Mr. Mack pointed out that they have a lack of track facilities, and fail entirely to properly classify trains. Whole trainloads are sent to the eastern terminals from the west, he said, which are unclassified until they arrive at the congested terminals. He said that the railroads should classify cars further in the interior, increase their team track facilities, shut off absolutely all supplies to the east, especially in New York, until the present situation is relieved, and that they should pool their lighterage facilities in New York, either working with a common end in view or else see that the lighterage facilities there are operated by one company.

It would be interesting, he said, to find out how, within 100 miles of New York, the carriers have been preparing themselves to meet this crisis, which they must have seen coming six months ago.

"We have cars out as far back as last October for which we have had steamship space over and over again," he said. "We have cars out for which we have had space ordered nine different times, but they have been kept out each time because they did not arrive on time. It is not entirely the fault of the export shipper."

Mr. Mack also disputed the statement that the lack of sailing facilities had anything to do with the situation, as shown by the fact that in 1915 there were 732 more sailings than in 1914, and that there was less tonnage due to the fact that so many of the large ocean liners are not making their sailings. They had a large tonnage, he said, all of which was reported, but much of which was not used at all.

Speaking of the business of the United States Steel Corporation, he said it did almost nothing in furnishing munitions of war, the chief product of this nature which had been furnished being barbed wire. The Corporation, he said, is seeking to serve the commercial interests, this being the time, above all others, when American shippers should be assured adequate service.

Replying to questions by the commissioners, he ventured the assertion that the shipping of munitions of war had not had so much to do with the present crisis as had been claimed, and possibly constituted only about one-fifth of the entire export business. The great bulk of the commercial shipments, said Mr. Mack, is to places which American manufacturers and shippers did not know were on the map, and which were formerly supplied by Germany, Belgium, France and England.

May Soon Decide

Washington, March 14.—Arguments in the case regarding rates on iron ore from Lake Erie ports to furnace points in western Pennsylvania, Ohio and West Virginia having been set last Friday by the interstate commerce commission for April 7, it is understood the commission expects to hand down a decision before the shipping season on the Great Lakes is far advanced this year. It has been recognized that this would give short time to prepare a ruling after the arguments are made, but the case has been before the commission in one form or another for four years and, since all of the elements were consolidated, it has been thoroughly threshed out.

Armor Plate Bill

Washington, March 11.—Voting on the administration armor plate bill or amendments that may be offered to it began at 4 o'clock Tuesday, March 14. By a rule passed, when the measure was made the unfinished business of the senate, upon motion of Senator Tillman, chairman of the senate committee on naval affairs, no senator might talk on any single amendment or the bill itself more than once or longer than five minutes after the voting was begun. After the bill was given the right of way last Thursday over all other measures, Senator Tillman had it laid aside temporarily, and indicated his intention not to call it up again before Tuesday unless those opposed to it desired to do so in the

meantime. Supporters of the measure showed, by this course, that they felt confident the bill would pass, and left the aggressive to opponents of the bill.

The motion to make the bill the unfinished business was carried by a vote of 55 to 10. Those opposed to taking up the measure were Senators Brandege, Catron, Dillingham, du Pont, Gallinger, Nelson, Oliver, Smith of Michigan, Sutherland and Weeks, all Republicans.

Cast Pipe Rate

Washington, March 14.—In a decision handed down last Thursday, the interstate commerce commission held that the proposed increased rate on cast iron pipe in carloads from Charlotte, N. C., to Pacific coast terminals from 55c to 65c per 100 pounds was not justified, but authorized the railroads to establish a rate which shall not exceed that from Chattanooga, Tenn., or Birmingham, Ala., by more than 5c per 100 pounds. The Chattanooga and Birmingham rate being 55c, the new rate from Charlotte will therefore be 60c, instead of 55c, the present rate. The order establishing the new rate becomes effective on May 1.

Mineral Output

Toronto, March 13.—The preliminary report of the mineral production of Canada during 1915 by John McLeish, chief of the division of mineral resources and statistics, shows that as a result of the demand created by the war the metal mining industry has shown the highest production ever recorded. Notwithstanding a considerable decrease in the production of construction materials such as cement, clay products, and a large increase is still shown in the total mineral output. The total value of metal and mineral production was $138,513,750, compared with $128,863,075 in 1914, and $145,634,812 in 1913, the latter being the record year. The value of metallic production was $77,046,082, as compared with $59,386,619 in 1914, and $66,361,351 in 1913. The production of nickel, copper and zinc is the highest ever recorded. The principal items are as follows: Gold, 916,076 oz., value $18,936,971; silver, 28,201,735, value $14,088,397; copper, 102,612,486 lbs., value $17,726,307; nickel, 68,077,823 lbs., value $20,423,348; lead, 45,377,065 lbs., value $2,541,116.

Iron ore shipments in 1915 amounted to 398,112 tons, valued at $774,427, as compared with shipments in 1914 of 244,854 tons, valued at $542,041. Last year's shipments included hematite, 205,989 tons, washed siderite, 132,906 tons, and cobbed magnetite and concentrates, 59,217 tons. Exports of iron ore amounted to 79,770 tons, valued at $206,823, and imports to 1,499,722 tons, valued at $2,320,066. Shipments from Wabana mines, Newfoundland, by the two Canadian companies operating there were 868,451 tons, of which 802,128 tons were shipped to Cape Breton and 66,323 tons to England.

The total output of pig iron in Canadian blast furnaces in 1915 was 913,719 tons valued at approximately $11,592,819, as compared with a production of 783,164 tons of the approximate value of $10,002,856. A large proportion of this is used directly in the manufacture of steel.

Here Are the Questions Which Will Be Put to Business Men

The federal trade commission is preparing to ask business men a series of questions, to secure data on business conditions. A summary of the industry in which each individual is engaged will be sent to him when prepared by the commission. The commission states that no information will be disclosed or published regarding the business of any particular concern. Following is a copy of the list to be sent out:

INFORMATION FURNISHED IS FOR THE YEAR ENDING.....191..
(Answers should cover calendar year 1915 or your fiscal year corresponding most nearly thereto.)

1. Name of concern.....
   Main office .....
   (Street) (City and State)
2. Kind of business in which engaged.....
   If manufacturing or producing, state principal product or class of products manufactured or produced.....
   If mercantile, state principal commodity or class of commodities dealt in and whether retail or wholesale.....
3. Capital stock outstanding at close of year:—
   Common stock ..... $.....
   Preferred stock ....
4. Bonds and similar obligations outstanding at close of year..... .....
5. Accumulated surplus (including undivided profit), or accumulated deficit at close of year (if deficit, so indicate)..... .....
6. Net sales for year (gross sales less trade discounts and out-going freight on sales)..... .....
7. Net profit (or loss) from operations during the year after deducting all expenses except interest on bonds and on similar obligations.... .....
8. Net income from other sources during the year..... .....
9. Depreciation on plant and equipment charged off during the year..... .....
   Average rate, per cent, 1915.....; 1914.....; 1913.....;
10. Bad debts charged off or provided for during the year..... .....
11. Have items 9 and 10 been deducted in arriving at item 7?..... .....

Signature.....
President,
Date.....191...

The coal output shows a slight decrease, being 13,209,371 tons, valued at $31,957,757, as against 13,637,529 tons, valued at $33,471,801 in 1914. The total output of oven coke was 1,200,766 tons, the amount sold or used during the year being 1,168,921 tons of the value of $4,253,536. In 1914 the total output was 1,015,253 tons and the quantity sold or used by producers was 1,023,860 tons, valued at $3,658,514. The by-products of coke made in 1915 included for the first time a production of benzol and associated compounds. The production of trinitrotoluene near the close of the year was reported at 100,000 pounds per week. There were about 1,742 ovens in operation at the end of the year. Imports of coke amounted to 637,857 tons and exports were 35,869 tons.

High Water Mark

Despite the handicap of lack of freight cars for the adequate moving of motor cars, figures collected by different Detroit sources show that the automobile industry in this country is now at its high-water mark. During the past three months, the entire industry, exclusive of the Ford company, showed an increase of 145 per cent over the same period a year ago. Companies are now behind in their shipments and a portion of this is due to the failure of the corporations to secure adequate railway facilities. This condition exists especially on eastern shipments. In some cases, flat and coal cars are being impressed into the service. The White Co., Cleveland, is shipping 10 motor trucks daily to France. It also has a heavy domestic demand.

The United Smelting & Aluminum Co., New Haven, Conn., has opened a New York office at 24 Stone street.

Important Changes

The Davis-Bournonville Co., New York City, manufacturer of oxy-acetylene and oxy-hydrogen welding and cutting equipment, has made several changes and additions to its selling force. W. R. Noxon succeeds W. S. Schoenthaler as manager of the Chicago office, Mr. Schoenthaler having been transferred to the company's general offices at Jersey City, N. J. Mr. Noxon has been affiliated with the company since 1908. H. H. Armstrong was recently appointed sales manager for the Pittsburgh district, the office and demonstrating plant having been removed to 316 Penn avenue. A demonstrating plant and a commercial welding department also have been established at 147 West Austin avenue, Chicago, with F. J. Maeurer, formerly superintendent of the welding department at the Jersey City shops in charge. H. Ulmer succeeds Mr. Maeurer as superintendent of the Jersey City welding department. John B. Redd, formerly with the Pacific Gas & Electric Co. and superintendent of the collective gas exhibit at the Panama-Pacific exposition, and George S. Pearson, until recently affiliated with the American Stove Co., have joined the Davis-Bournonville sales organization. Mr. Redd will give special attention to the artificial and natural gas industry in the application of oxy-acetylene welding to pipe lines and other work and Mr. Pearson will be connected with the general offices at Jersey City. The Davis-Bournonville Co. now is erecting an additional building at its Jersey City plant which will increase the floor space 40,000 square feet and which will enable the company to practically double its output.

Enters Oxygen Field

The Air Reduction Co., 50 Broad street, New York, announces its entry into the oxygen field. It expects to have its first plant in operation in Philadelphia within the next few weeks. During the next few months the company expects to locate additional plants in all of the large oxygen consuming centers of the country. These plants will produce oxygen by the Claude process, in conjunction with some features of the Place process. Walter W. Birge is president of the new company.

General Agent.—The Rodd Co., recently incorporated in Pennsylvania, has been appointed general agent of the Ohio Wood Preserving Co., the Pittsburgh Wood Preserving Co. and the Michigan Wood Preserving Co., of Pittsburgh, and the Compressed Wood Preserving Co., Cincinnati. These companies manufacture creosoted lumber, ties and wood blocks. The Rodd Co. also will handle special plant and engineering equipment. Thomas Rodd Jr. is president and treasurer, and Ernest L. Park is vice president and secretary of the company, offices of which are in the Commonwealth building, Pittsburgh.

Takes Over Crucible Plant

The Pelton Steel Co. has been organized and incorporated at Milwaukee, with $100,000 capital stock. The incorporators are Gustav A. Reuss, Fred Vogel Jr., and William H. Schuchardt. The company has taken over a crucible steel plant at Chicago avenue and Elliott plate, close to the plant of the Nordberg Mfg. Co. An electric furnace has been bought and is expected to be in operation about June 1. In the meantime, the crucible furnaces will be operated and deliveries are expected to begin by April 1.

E. T. Pelton is general manager. He is well known among foundrymen, having been active in the steel casting business in Milwaukee for several years, 12 years being spent with the American Steel Foundries.

Was Ready to Make Munitions

Marion, Ind., March 13.—A fire which damaged the plant of the Bell Bottle Co., at Fairmont, Ind., last week, has disclosed that the plant had been idle as a glass factory for several months and that it had been equipped as a war munition plant. One hundred and twenty-five lathes had been installed, and, although operations had not been started, the factory was to make shells. A. B. Scott, general manager of the company, said that the fire was of incendiary origin. A guard maintained at the factory is to be increased and the equipment will be completed.

At Uncle Sam's Command

G. W. Hoadley, head of the Bridgeport Projectile Co., Bridgeport, Conn., has sent a message to Washington to the effect that the entire plant and equipment would be placed at the service of the United States government in event of trouble with Mexico.

The plant has a capacity of 10,000 shrapnel shells a day.

Buys Old Mill

The inability of builders of rolling mill equipment in this and foreign countries to meet specifications for nearby delivery is reflected in the purchase of second hand equipment located in India by a manufacturer in Scotland. After scouring the markets of the world, the Scotland manufacturer found that he could purchase a blooming and rail mill, built in 1902, for the Bengal Iron & Steel Co., Barrakar, India. The mill, which has 28-inch rolls and pinions and electrically-driven tables, is being dismantled and will be set up in a plant in Scotland. The mill is equipped with reversing engines, 37½ x 54 inches.

Operating an Old Mine

Dover, N. J., March 13.—Owen J. Connelly, a mining superintendent and promoter of New York, has begun operations at the Cooperas mine, located along the Wharton railroad at the base of Green Pond mountains. Mr. Connelly took about 50,000 tons of ore from this mine from 1873 to 1876. Senator Jones, of California, reopened it in 1901, but ceased operations soon afterwards because of the sudden slump in the iron market. Three diamond drills are ready to be installed at the mines, and it is expected that when the machinery is started about 10,000 tons per month will be mined.

About 13 years ago, the Carteret Steel Co., which had a blast furnace at Hackettstown, operated the mine for a short period. The ore is a magnetite analyzing about 60 per cent in iron and contains about 4 to 5 per cent of sulphur, so that roasting treatment may be adopted. The mine is about 10 miles wide and runs across the state to the Hudson river. The depth of the vein has never been determined, shafts in the vicinity of Wharton being several thousand feet deep. Samples of ore taken from the abandoned Winget, Cobb and Denmark mines, also located on the same vein, show an excellent grade of ore, and it is thought that these mines will be opened next summer. Samples have also been taken from the Dalrymple mines near Mount Freedom. This mine is some distance from any railroad and the ore would have to be hauled several miles.

Increasing Capacity.—A permit has been issued for the Champion Spark Plug Co.'s new building on Upton avenue, Toledo, which is to be completed and ready for occupancy by

June 1. The building will be six stories, of concrete and steel, 84 x 140 feet. The improvements provide for 55,000 square feet of additional floor space, or double the present capacity of the factory. New machinery has been ordered and the daily output will be increased from 50,000 to 100,000.

Acquires Ship Yard

Controlling interest in the Pusey & Jones Co., Wilmington, Del., shipbuilders and manufacturers of paper machinery, has passed to Christoffer Hennevig of the ship brokerage firm of Hennevig & Johnson, 78 Broad street, New York City. This firm in recent months has placed contracts with the various yards in this country for a large number of merchant ships for foreign interests. It is understood that the capacity of the Pusey & Jones Co. yard is to be materially increased to enable it to construct vessels of larger size. The machinery side of the business also is to be extended. The company will be operated by the same officers and organization.

Placing Foreign Orders

The Stow Mfg. Co., Binghamton, N. Y., has made an arrangement with the American Express Co. whereby customers in foreign countries desiring to place orders may simplify the execution by giving them to the nearest foreign office of the Express company, which will transmit orders and also open credits or accept payments and handle details of shipping, customs, etc. The Stow Mfg. Co. believes that much time and annoyance will be saved to small purchasers in foreign countries by this arrangement.

New Cement Plant Opens.—The Duluth plant of the Universal Portland Cement Co. has begun operations. Mill No. 7, as it is called, has four kilns 150 feet long, with a daily capacity of 4,000 barrels. Blast furnace slag and limestone are the raw materials. The plant adjoins that of the Minnesota Steel Co., which supplies the slag, and the limestone comes from Calcite, Mich. All the grinding and burning machinery, elevators and conveyors are operated by individual motors and the same processes of manufacture are used as in the other mills of the company. Power is furnished by the Great Northern Power Co. from its hydroelectric plant at Thompson, Minn., on the St. Louis river, 15 miles distant.

Shipbuilding

And Other Industries on Pacific Coast Are Very Busy.

San Francisco, March 11.—Orders for the construction of all kinds of steamers, oil tankers, etc., have come in not only from the Pacific coast, but from the eastern cities where the shipyards became congested with orders early in the game. The purchase of the United Engineering Works, of Oakland, by the Union Iron Works, of San Francisco, of course, created a good deal of interest. It was a natural development for this subsidiary of Bethlehem Steel, with its strong financial backing, and will augment considerably its facilities for turning out boats. The Mare Island navy yard of the government is to build a new destroyer for the United States navy; this is said to presage the resumption of the building of larger warships at this yard, and when plans are completed for improving the plant it should become an important factor in the defense program of the nation.

Discuss Iron Mining

The recent discussion by engineers and others on the possibility of making iron and steel in California has given rise to a good deal of talk on the subject. This, with the increase of mining in southern California of such miscellaneous materials as tungsten, antimony, quicksilver, borax, etc., has caused rumors to be spread that strong interests are figuring on the practicability of mining the excellent grades of iron ore in southern California, bringing coal from Utah and making iron on the coast. The rumors even went so far as to name the Union Oil Co. as a possible entrant into the iron business. It is recognized that now is a favorable time to start an iron industry on this coast, and prospects seem good for a continuance of the demands here for iron and steel in various trades. The old bugbear of the high price of labor and exorbitant union restrictions militates against such a move; but on the other hand it is said, with much truth, that the fact of high wages, while a disadvantage, is not an unsurmountable difficulty. Incidentally, chromite iron ore is being mined to the extent of 16,000 tons at Porterville by D. A. Vaughn.

The Union Iron Works is expanding its plant and making money. In addition to the mammoth new dry dock at Hunter's Point which this company has planned, a new brass foundry is being started for which a steel-and-concrete one-story building will be constructed, besides several minor improvements and additions in its shipbuilding department. The shipbuilding and ship repair business is, of course, the chief work of the Union Iron Works, and it is in that line that the present activity is mostly centered. Having little competition of a large-scale variety on the coast, and with strong eastern connections through being a subsidiary of Bethlehem Steel Corporation, the Union company enjoys a decided advantage in its unique situation at the great Pacific port by the Golden Gate. Its recently-decided expansion as to a deep-draught repair dock for large vessels merits the thanks of the United States navy for providing the only adequate plant of its kind on this country's western coast.

Activity is aparent in the gas engine business. The several gas engine manufactories situated at San Francisco are enjoying a much improved business over the conditions of a year ago. The Union Gas Engine Co., the Standard Gas Engine Co. and the Imperial Gas Engine Co. are all unusually busy. A number of new factories and mills under construction in the Pacific coast states are specifying gas engines as their motive power. The building trades are rosy with hope after a long, hard siege of inactivity; and while a good deal of idleness is yet manifest, the spirit of new construction is gaining ground daily.

Takes Over Machinery Company

New York, March 14.—The American International Corporation, recently organized with a capital of $50,000,000 by interests identified with the National City Bank, announces that it has taken over the Allied Machinery Co. of America and proposes to extend and develop the business of the latter. The Allied Machinery Co. was organized about four years ago by officers of the National City Bank, with a capital of $200,000, and with headquarters in the bank's building at 55 Wall street. The company has offices and show rooms in Paris, Petrograd, Zurich and Turin; its branches in Austria-Hungary are closed temporarily on account of the inability to ship goods. The taking over of this company, according to Charles A. Stone, president of the American International Corporation, is in line with the latter organization's policy of assisting American interests in establishing business relations with foreign countries.

Thirty Million for Shell Contract

Negotiations Under Way for Number of Large-Swing Lathes to Execute Work —Seaboard Air Line Will Soon Close Big Order

THE placing of a huge new shell contract is the chief feature of interest in the machine tool market at this time. This contract calls for shells of large diameter and is understood to involve about $30,000,000. It has been let by one of the belligerent governments to a large concern, having several plants, which was one of the first in this country to abandon in part the manufacture of its regular line of products in order to engage in the manufacture of munitions. This company has negotiations under way for the purchase of a number of large-swing lathes for the earliest delivery possible and this business is expected to be awarded without delay. Outside of this development, interest attaches chiefly to the negotiations which now are being conducted by the Seaboard Air Line on this list, which it issued several weeks ago. It is expected that awards will be made as soon as possible and the trade looks for formal notifications almost any day. Aside from this business the market is quiet; there continues to be a fair volume of export demand, and domestic bookings are fairly brisk, but the current orders are of a scattered and small-lot character.

The following eastern concerns are expanding or about to expand their capacity: Atlas Ball Co., Philadelphia; Edison Electric Illuminating Co., Boston; Ingersoll-Rand Co., Painted Post, N. Y.; United States Metal Refining Co., Chrome, N. J.; Eastern Metal & Refining Co., Charlestown, Mass.; G. C. Roberts Tack Co., Whitman, Mass.; Rowe Calk Co., Hartford, Conn.; Davis Foundry Co., Lawrence, Mass.; American Smelting & Refining Co., Perth Amboy, N. J.; I. X. L. Pump Co., Philadelphia; Earle Gear & Machine Co., Philadelphia; Cowan Truck Co., Holyoke, Mass.; Benedict & Burnham branch of the American Brass Co., Waterbury, Conn.; Stanley Bronze Co., Bridgeport, Conn.; United Smelting & Aluminum Co., New Haven, Conn.; Splitdorf Electric Co., Newark, N. J.; Berks Engineering Co., Reading, Pa., and the Eastern Brass & Ingot Co., Waterbury, Conn.

Steady Flow of Orders in Chicago

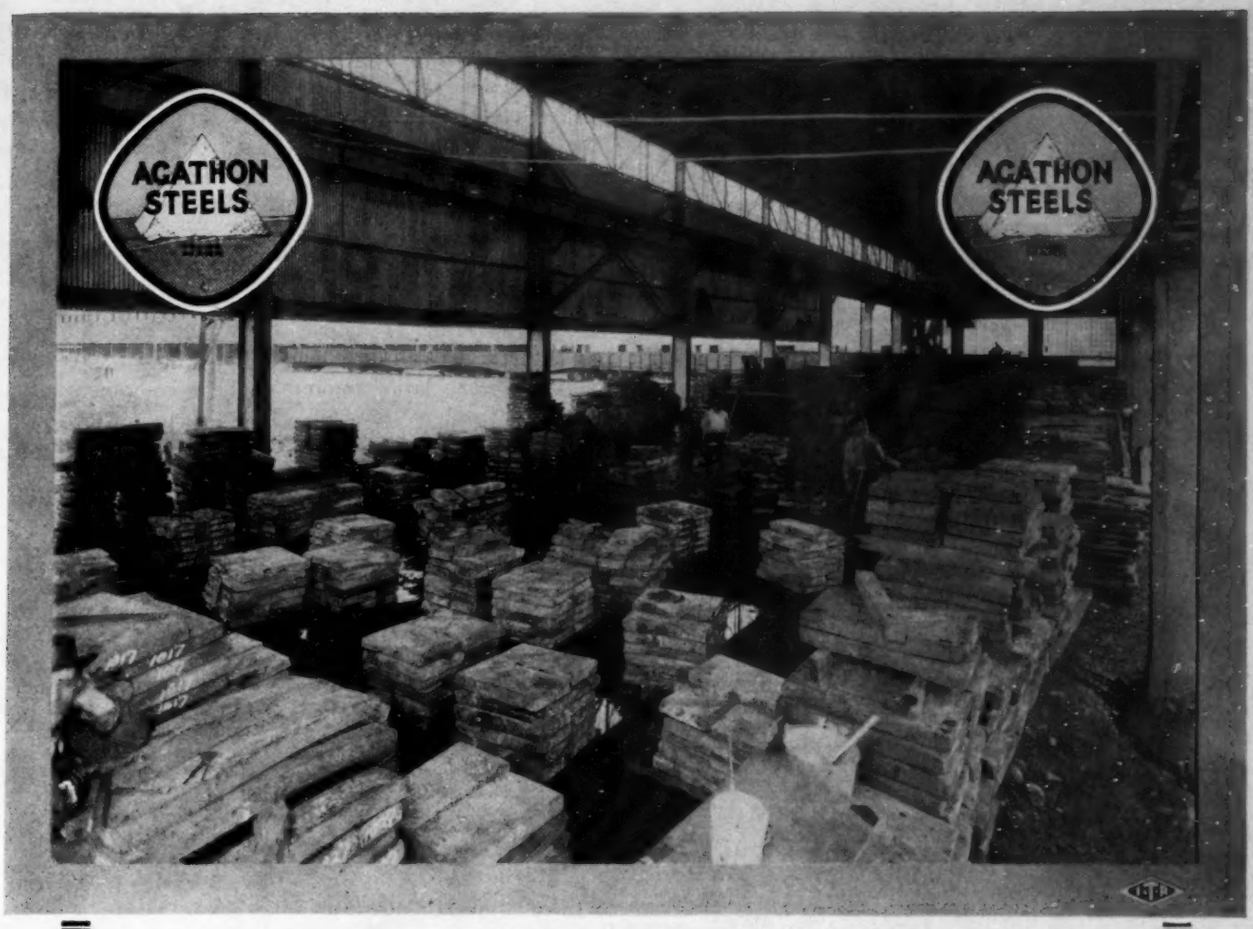
THE lack of machines continues to be the greatest drawback in the Chicago market. A good-sized inquiry is being received steadily, but it cannot be accommodated. Prices, at present 40 per cent higher than normally, do not seem to prevent buying when equipment is urgently needed and can be obtained. A strong pressure is being brought to bear for hand and automatic screw machines to handle stock 1½ inches in diameter and smaller. This demand comes from concerns about to engage in the manufacture of timing and other accurate devices used on munitions. The Illinois Central railroad is said to be preparing a large list of tools, which may run as high as $200,000. This road has bought considerable machinery lately in scattered lots and has taken second hand material in order to obtain deliveries. The Waite Tractor Co., Elgin, Ill., has established a plant for the manufacture of tractors and agricultural implements and recently bought its equipment in this market. Several other concerns in Chicago or nearby have been able to obtain their requirements recently.

Mill Equipment Builders Rushed

PROSPERITY enjoyed by manufacturers of steel products has resulted in unusually heavy demand for rolling mill equipment. Most builders of rolling mill machinery in the Pittsburgh district are unable to promise deliveries in less than from three to six months, but buying has been heavy, despite retarded shipments. The National Tube Co., which will build a complete tube mill at Gary, Ind., has sent out preliminary inquiries for rolling and finishing mill equipment. The company will purchase from 15 to 20 electrically operated cranes, having capacities ranging from 15 to 125 tons. The Chattanooga Steel Co., Chattanooga, Tenn., is closing negotiations for a 125-ton ladle crane, a charging machine and five cranes for the open hearth and rolling mill departments. The Standard Seamless Tube Co., Pittsburgh, is asking bids on four cranes of 10, 15, 30 and 50 tons capacity, and the Donner Steel Co., Buffalo, is in the market for a 15-ton crane. The latter concern has awarded contracts for two ore bridges and is expected to buy some additional rolling mill equipment. The Mesta Machine Co. has just purchased two 30-ton cranes from the Alliance Machine Co., Alliance, O. Purchasing agents for railroads, having headquarters at Pittsburgh, have been buying a large number of single tools, including punches and shears.

Cleveland Dealers Feeling Market's Pulse

THERE has been little change in the machinery market in the Cleveland district the past few days. The steady flow of orders coming from a diversity of sources keeps the market buoyed up and dealers are optimistic. Small manufacturers in Dayton, Canton and Sandusky are entering the market daily for a few tools. The local plant of the National Carbon Co. has been negotiating for one or two tools, but, as a rule, this concern enters the market for equipment only at rare intervals. Delays on shipments are becoming more frequent and while some builders insist that labor difficulties are responsible for this condition, there



Our Ideal Facilities for Sorting, Marking and Shipping "Billets" and "Slabs"

Spacious and well protected, with cranes and all other modern equipment for convenience and time saving, our billet and slab shipping facilities are unrivaled.

Backing up our rapid and thorough methods throughout the manufacture of "Agathon" Steel is a railroad spur which enters our "billet shed" and insures prompt shipment.

"Agathon" *Quality* and *Service* always go hand in hand.

AGATHON STEELS

WILL SERVE YOUR PURPOSES *BEST!*

WE MAKE

"AGATHON" Chrome Nickel
"AGATHON" Chrome Vanadium
"AGATHON" Nickel Steels
"AGATHON" Special Analyses
"AGATHON" Vanadium
"AGATHON" Silico-Manganese
"AGATHON" Chrome Steel
"AGATHON" High Carbon

THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

Detroit Office: 326-27-28 Ford Bldg., F. Walter Guibert, District Representative
Cleveland Office: Hickox Bldg. - The Hamill-Hickox Co., District Representative

Say you saw it in THE IRON TRADE REVIEW

has been more than one opinion expressed that this state of affairs is due to the fact that plants have oversold their capacity. This situation is becoming serious and some dealers are a little skeptical about ordering machines from the less well-known builders.

Cincinnati Business Falling Off

INQUIRIES for machine tools received by local builders and dealers have fallen off perceptibly. Manufacturers feel that the heavy demand of six months ago having been partly supplied, and also the embargo placed upon machine tools by the English government is responsible for this condition. Interest of domestic buyers in lathes is much heavier than for any other tool. Small bench and portable electric grinders and drills are also selling in heavy lots in all parts of the country. A report from Hartford, Conn., stating that practically all strikes of machinists in that city have been called off, has greatly encouraged machine shop operators in the Cincinnati district, who have been contending with similar strikes since the third quarter of 1915, but who now have the situation well in hand. More machinists are employed in Cincinnati at present than before the strike was declared. The Cincinnati Gear Co. has purchased a site for an addition which will double the capacity of its plant. Plans are being prepared for a large garage building to house 1,000 automobiles, which will be built at Third and Vine streets, and which will require a large amount of light equipment. The Oakley Machine Tool Co., a new Cincinnati incorporation, will build machine tools. The C. M. Robinson Co., which will make refrigeration machinery, is also a new incorporation.

Among New England Factories

LEWISTON, ME.—The Concrete Materials Co. has been incorporated; $10,000 capital stock; by Franklin Fisher, Joseph Mitchell and Chandler Barron.

PORTLAND, ME.—The Tidewater Equipment Corporation has been incorporated to build all kinds of tools, hardware, boilers, etc.; $250,000 capital stock; by Eben Winthrop Freeman and Wallace E. Parsons.

RUMFORD FALLS, ME.—The Rumford Falls Power Co. has announced that it will begin the construction of a new concrete dam to be located several hundred feet nearer the falls than the present structure. The capacity of the new power station will be four times that of the plant now in operation. It is estimated that two years will be required to finish the construction and put the new project into commission.

GOFFSTOWN, N. H.—The academy of Villa Augustina will build a concrete, brick and stone, 4-story, 54 x 165-foot building to cost $60,000.

BOSTON.—The Eastern Metal & Refining Co. has been granted a permit for the erection of a melting shop in Charlestown.

BOSTON.—Fire in the Shoe and Leather building, 112 Bedford street, did about $50,000 damage to manufacturing concerns.

BOSTON.—The City of Boston will build a municipal building at Washington and Ashland streets, Roslindale, to cost $124,000.

BOSTON.—Fire in the fireproof 8-story building at 228 Summer street did $30,000 damage. The Markem Machine Co. and the Hixon Electric Co. were damaged.

BOSTON. — The Framingham Machine Works has been incorporated; $30,000 capital stock; by John J. Coakley, Herbert P. Mason and J. Sidney Stone.

BOSTON.—The Ashton Valve Co. has been incorporated; $150,000 capital stock; by Albert C. Ashton, Ellery Peabody, Adrian D. Perry, Harry H. Ashton and George P. Pote.

BOSTON.—The Merrimac Valley Power & Buildings Co. has been incorporated; $400,000 capital stock; by David J. Donahue, Gustave H. Madsen and Chandler M. Wood.

BOSTON.—The Tel-Dox Co. has been incorporated to make mechanical specialties; $100,000 capital stock; by Rufus L. Wilbor, Gilbert Hodges Jr., and William G. Renwick.

BOSTON.—The Old Colony Construction Co. has been incorporated; $100,000 capital stock; by John C. Sullivan, Louis E. Rourke, Edward C. Sherman and Albert J. Gerdetto.

BOSTON.—The Harringford Mfg. Co. has been incorporated; $25,000 capital stock; by Alfred Winsor, Brookline, Mass., H. H. Gilman and H. R. Deming.

BOSTON.—The Edison Electric Illuminating Co. has purchased considerable property in South Boston and it is expected a large power plant will be erected.

BOSTON.—The American Scale Co. has been incorporated to make weighing and coin-operating machines; $75,000 capital stock; by John M. Nelson, James B. Coughlan, Dover, Mass., and N. Wales.

BOSTON. — The Precourt-Kelley Co. has been incorporated to engage in general construction; $50,000 capital stock; by Charles J. Precourt, John E. Kelley and Nicholas J. Murphy.

BOSTON.—The Thomas W. Reed Co., Inc., has been incorporated to make surgical instruments; $25,000 capital stock; by Arthur I. Shain, Joseph Marksville, Thomas Washington Reed and Belle D. Shain.

BOSTON.—The Farnsworth Mfg. Co. has been incorporated to make all kinds of appliances for handling steam and water; $150,000 capital stock; by Frederick C. Farnsworth, Kenneth L. Lindsey, and H. W. Evans.

BOSTON.—The Daniel O'Keefe & Son Co. has been incorporated to build mechanical vehicles; $10,000 capital stock; by Edward A. Lomer, James O'Keefe, Anna O'Keefe and D. O'Keefe Jr.

BOSTON.—The Daniel Russel boiler works, 91 Boston street, was damaged to the extent of several thousand dollars by fire. A considerable number of patterns and some of the machinery were destroyed.

BROCKTON, MASS.—Fire damaged the 4-story brick building occupied by the Brockton public market to the amount of $100,000.

CAMBRIDGE, MASS.—The Barnard Construction Co. has been incorporated; $25,000 capital stock; by Edward A. Barnard, T. A. Barnard and M. E. Grover.

CAMBRIDGE, MASS.—The property of the Cambridge Gas Light Co. was damaged by fire to the extent of $100,000. The pattern shop of the Mead, Morrison Co., was slightly damaged.

HAVERHILL, MASS.—Bids close March 20 for three reinforced concrete, 2-story, 99 x 240-foot factory buildings to cost $250,000 for the Gillette Mfg. Co., Lowell, Mass.

HOLYOKE, MASS.—Cowan Truck Co. has let a contract for the erection of a 2-story, 100 x 200-foot factory addition.

LAWRENCE, MASS.—George E. Kunhard has awarded contract for a 5-story and basement, 80 x 340-foot addition to his plant.

LAWRENCE, MASS.—The Davis Foundry Co., now located on Island street, will erect a plant at Market and Parker street. Plans for the building were completed sometime ago, but erection of the plant was postponed.

LOWELL, MASS.—The Appleton Co. will build a 5-story and basement, 75 x 191-foot mill to cost $100,000 on the site of its No. 2 mill erected in 1828.

LYNN, MASS.—Plans will be ready for inspection March 20 for a reinforced concrete fireproof, 6-story, 56 x 109-foot factory to cost $100,000 for the Campbell Electric Co.

NEW BEDFORD, MASS.—L. E. Locke, Lawrence, Mass., has been awarded a contract to build a brick and steel mill to cost $400,000 for the Manomet Mills. The 757,000 spindles in the mill will be electrically operated.

NEWTON, MASS.—Plans will be ready to figure March 21 for a reservoir for the city of Newton at Waban hill, to cost $75,000.

WESTFIELD.—The Bay State Foundry Co. has been incorporated; by W. C. Waldron, Harry B. Putnam and Theodore C. Brien. The company has leased the plant of the Westfield Foundry & Valve Co., George W. H. Reynolds, Troy, N. Y., will have charge of the foundry.

WEST STOCKBRIDGE, MASS.—Fire damaged the plant of the Granger Lime & Marble Co. causing a loss of $40,000. The plant will be rebuilt at once.

WHITMAN, MASS.—The brick manufacturing plant of the Whitman Mfg. Co. has been sold to the G. C. Roberts Tack Co., which for sometime has been occupying part of the plant. The tack output will be enlarged, and the remainder of the plant will be remodeled for leasing to other manufacturing concerns.

WORCESTER, MASS. — The Estabrook heirs are having plans prepared for a brick,

Crawford Ore from the Dean-Itasca Mine on the Mesabi Range

The ore is non-bessemer, of good coarse structure. Dean-Itasca mine shipments for 1915 were 486,374 tons, mostly since August 1. For 1916 they will be considerably greater.

A complete analysis of Crawford Ore from Dean-Itasca Mine in natural state and dried at 212° Fahr.

	Dried 212°	Natural
Iron	58.35	50.2451
Phosphorus	.065	.05597
Silica	6.03	5.1924
Manganese	1.00	.8611
Alumina	3.40	2.9277
Lime	.16	.1377
Magnesia	.12	.1033
Sulphur	.031	.0266
Volatile Matter	5.74	4.9427
Moisture	13.89	

Crawford Ore Guarantee for 1916, 51.50 Per Cent Iron, Natural

The output of this mine during 1916, together with our five other mines, gives us an unusually large tonnage.

We are now taking contracts for this ore and will be glad to figure on your requirements for the coming season.

THE TOD-STAMBAUGH COMPANY

Perry-Payne Building

CLEVELAND :: :: :: :: OHIO

75 x 260-foot factory building at Jackson and Beacon streets.

WORCESTER, MASS. — The Stockbridge Machine Co. has acquired property adjoining its factory for further expansion.

WORCESTER, MASS.—The O. & J. Machine Co. has leased the 4-story Peter Wood factory on Gold street and will remove from its present location, 87 Mechanic street. Additional machinery will be installed.

WORCESTER, MASS.—J. Francis Southgate has awarded a contract for a brick, steel and concrete, 2-story and basement, 60 x 62-foot garage to cost $60,000 at 747-753 Main street.

WORCESTER, MASS.—The Spencer Wire Co. has plans under consideration for the addition of another factory building on Webster street. It will be connected with mill No. 2 on the opposite side of the streets by a subway under the street.

WORCESTER, MASS.—The National Mfg. Co. has been incorporated to make metal and wire goods; $1,000 capital stock; by Paul B. Morgan, Charles F. Morgan, and Ralph L. Morgan. The company has taken over the business of the firm of the same name incorporated for $50,000 in 1874 and will be operated as a department of the Morgan Spring Co.

WORCESTER, MASS.—The Vernon Machine Co. has been incorporated to make an 11-inch Prentice lathe; $10,000 capital stock; by Vernon F. Prentice, Victor E. Rolander, Harry V. Prentice and Chester W. Warren. V. F. and Harry V. Prentice were formerly of the Prentice Bros. Co., absorbed by the Reed-Prentice Co., April 1, 1912. This company has started making lathes at 54 Hermon street and plans to build a factory.

WARE, MASS. — A $50,000 corporation is to be organized to build a branch factory for the Ideal Coated Paper Co., Brookfield, Mass., which it will lease. About $50,000 worth of new machinery will be installed.

PROVIDENCE, R. I.—Bids for the construction of the great $5,000,000 dam in Kent for the new Scituate reservoir will be asked within a few months.

PROVIDENCE, R. I. — The New York, New Haven & Hartford railroad will spend $2,000,000 in enlarging and improving its freight facilities in Providence and $700,000 for the erection of a freight house in Westerly, R. I. When the latter is completed the road will abandon its old freight house on Canal street.

PROVIDENCE, R. I.—Fire destroyed the coal pocket of the New York, New Haven & Hartford railroad at Harbor Junction wharf, causing $85,000 damage.

PROVIDENCE, R. I.—The Agawam Chemical Works has been incorporated; $10,000 capital stock; by Augustus H. Fiske, Erik H. Green and Thomas A. Jencks Jr.

PROVIDENCE, R. I. — The Narragansett Electric Lighting Co. has ordered from the Westinghouse Electric Co., a 45,000-kilowatt turbine for its Elm street power plant. This addition will more than double the capacity of the plant.

WESTERLY, R. I.—The Westerly Light & Power Co. has made application to have its charter amended so that it may increase its capital stock from $700,000 to $1,000,000 to be used for improvements.

BRIDGEPORT, CONN.—Bids close April 6 for the construction of the superstructure of two bridges to cost $300,000 at Grand and Washington streets, for the city of Bridgeport.

BRIDGEPORT, CONN.—The R. E. Parsons Foundry Co. has let a contract for the erection of a 1-story and basement, 110 x 300-foot foundry.

BRIDGEPORT, CONN.—A. H. Wilson Machine Co. has let a contract for the erection of a 1-story, 30 x 108-foot machine shop addition.

HARTFORD, CONN.—The Rowe Calk Co. is erecting a 1-story, 50 x 60-foot addition to be devoted to the manufacture of drop forged horseshoe calks.

HARTFORD, CONN.—Work on the superstructure of a granite, marble, brick and steel office building to cost $300,000 for the Phoenix Fire Insurance Co., at Elm and Trinity streets, will start March 15.

HARTFORD, CONN.—A. & S. Hartman will build a brick, 5-story, 50 x 150-foot warehouse to cost $40,000.

HARTFORD, CONN.—The new plant of the S. K. F. Ball Bearing Co. is being completed and it is expected that the installation of machinery will be begun in April.

NEW HAVEN, CONN. — The United Smelting & Aluminum Co. has let a contract for the erection of a 2-story, 75 x 110-foot addition.

NEW HAVEN, CONN.—The United Illuminating Co. has let a contract for the erection of a 2-story, 140 x 270-foot boiler room addition in Bridgeport.

NEW LONDON, CONN.—D. E. Whiton Machine Co. will build a 1-story, 20 x 150-foot machine shop addition.

NEW LONDON, CONN.—Plans will be ready about May 1 for the superstructure of a concrete, mill construction, 2-story, 100 x 1,000-foot pier shed and warehouse to be built by the state at a cost of $350,000.

NORWICH, CONN.—Max Gordon Corporation is having plans drawn by C. H. Preston, architect, Norwich, for the rebuilding of a factory which is to be used for the manufacture of rifles.

STAFFORD SPRINGS, CONN.—Smith & Cooley will shortly start work on a brick and concrete fireproof, 2-story and basement, 60 x 65-foot addition to their River street plant.

WATERBURY, CONN. — The Mattatuck Mfg. Co. has let a contract for the erection of a 3-story, 18 x 40-foot factory addition.

WATERBURY, CONN.—Benedict & Burnham branch of the American Brass Co. has let a contract for the erection of a 1-story, 70 x 240-foot, and a 1-story, 92 x 160-foot factory addition.

WATERBURY, CONN.—The Eastern Brass & Ingot Co. has let a contract to S. Austin & Co., Bridgeport and Cleveland, for the erection of a 2-story, 30 x 50-foot office and a 1-story, 58 x 200-foot factory.

Along the Middle Atlantic Seaboard

ALBANY, N. Y.—The Consolidated Car Heating Co. has let a contract for the erection of a factory addition.

BROOKLYN, N. Y.—The Iron Clad Mfg. Co., 929 Flushing avenue, has let a contract for the erection of a 3-story addition to its factory.

BUFFALO, N. Y. — The Buffalo Potash & Cement Co. will build a plant of steel construction at Katherine street and the Erie railroad.

LONG ISLAND CITY, L. I., N. Y.—The Degnon Realty & Terminal Improvement Co., New York, has let a contract to the National Fireproofing Co. for the erection of a 3-story, 100 x 400-foot factory building in Long Island City to be occupied by the Rome Metallic Bedstead Co., 149 Broadway, New York.

NEW YORK.—Otto Higel, Buffalo, has let a contract to the Turner Construction Co. for the erection of a 5-story, 275 x 275-foot piano factory in New York.

NEW YORK. — The Connecticut Electric Steel Co. has been incorporated; $5,000 capital stock; by W. W. Corlett, C. Margerum and E. L. Wilson, 2368 Eighty-third street, Brooklyn.

PAINTED POST, N. Y.—The Ingersoll-Rand Co., 11 Broadway, New York, has awarded a contract for the erection of an extension to its machine shop at Painted Post.

PORT JEFFERSON, N. Y.—The Anten Engineering & Contracting Co. has been incorporated to engage in dredging, filling, reclaiming land and general contracting; $50,000 capital stock; by A. V. Moore, E. J. McCormack and G. M. Anten, 267 Lenox road, Brooklyn.

SODUS, N. Y.—The Sodus Packing Co. is taking bids on the erection of a 2-story, 50 x 125-foot addition.

BRIDGETON, N. J.—The state of New Jersey has purchased three farms near Bridgeton and will erect an experimental station for southern New Jersey.

CAMDEN, N. J.—The engineering corps of the Philadelphia & Reading railroad, has completed plans for a terminal and ferryhouse on the property recently purchased from the John H. Dialogue Ship Building Co. The work will cost $1,500,000. There will be four ferry slips and 12 sets of tracks and auxiliary rails in the train shed. The company hopes to have the structures completed in about a year, according to Superintendent F. M. Falck. The ship building tract was purchased last December for $110,000.

CHROME, N. J.—The United States Metal Refining Co. has awarded a contract for the erection of a large addition to its plant in Chrome.

GLOUCESTER, N. J.—The Pennsylvania Ship Building Co. will shortly let a contract for its new $6,000,000 plant along the Delaware river, Gloucester. The company purchased 15 acres. Two shipyards will be erected. Haakon E. Norbom is president of the corporation.

KENVIL, N. J.—The Hercules Powder Co. is erecting a laboratory.

NEWARK, N. J.—The Beckton Chemical Co. has let a contract for the erection of a 1-story addition at 256 Vanderpool street.

NEWARK, N. J.—Splitdorf Electric Co. is about to let a contract for the erection of a 5-story addition to its magneto factory.

NEWARK, N. J.—The Emberd Mfg. Co. has been incorporated; $2,500 capital stock; by Simon B. Trauerman, New York, Julius Stein and Rose G. Higgins, Newark.

NEWARK, N. J.—The Seaboard Chemical Co. has let a contract for a 4-story steel and concrete factory plant and three 1-story buildings on Blanchard street. The four buildings will cost $36,000.

NEWARK, N. J.—Contracts have been awarded for the erection of a new plant here

Hot Mill Chats With

ROLLING MILL JIM

Fellows, of all the tough kind of rollin, Hot Mill work is at the head of the class. If the roll has a hard surface she busts, and if it's a strong roll the surface is on the blink. Then we have the roll that puffs up like a poisoned pup and loses shape if the roller turns around to spit. This here Hot Mill game is a lot different from rolling where you turn up the rolls, set the guides, and yell for steel. What the high-brows call the human element enters into it a heap. It's up to the rolls and the man with the tongs. You've got the man with the tongs, get the rolls from the company that knows how to make them to meet conditions. They are specialties and the boys at Hubbard have made a study of them. Take it up with them and see if you do not thank Jim for puttin you next.

So-Long—

Rolling Mill Jim.—

Hubbard Steel Foundry Co.

EAST CHICAGO, IND.

All Kinds of Iron and Steel Rolls and Steel Castings.

for the Seaboard Chemical Co. at Blanchard street and Lister avenue. The plant will include one 4-story and three 1-story buildings.

NEW BRUNSWICK, N. J.—The Public Service Corporation of New Jersey, Newark, will receive bids shortly for the erection of a sub-station addition, to cost $176,000.

NEW BRUNSWICK, N. J. — The Wasson Piston Ring Co. has filed plans with the state department at Trenton for the erection of a machine shop for the manufacture of piston rings. The structure will be 200 x 500 feet.

NEW BRUNSWICK, N. J.—The Unexcelled Fireworks Co. has purchased 170 acres on George's road and will erect a plant. President Bingle, of the fireworks company, says work on the plant will be started late in the spring and that the Chicago, Staten island and other factories may be combined.

ORANGE, N. J. — The Delaware, Lackawanna & Western railroad will erect 21 bridges in elevating its tracks through the city of Orange and also build a new station. The improvements will cost about $2,000,000.

PERTH AMBOY, N. J.—A permit has been granted for the erection of a 1-story, 70 x 90-foot addition for the American Smelting & Refining Co.

RAHWAY, N. J.—A sewage disposal plant to cost $100,000 will be erected by the common council.

TOMS RIVER, N. J.—The federal government has purchased 10 miles of beach front from Seaside park to Barnegat inlet and will have the channel dredged to allow the passage of torpedo boats and submarines. Part of the plans comprise a fort and the establishment of a torpedo boat, submarine and aeroplane base. The plot is 10 miles long and 1,800 feet wide and is said to have cost more than $100,000.

TRENTON, N. J.—The Jersey City Metal Treating Co. has been incorporated to handle and prepare steel and metals; $100,000 capital stock; by Henry Whitaker, Philadelphia, John E. Sandmeyer Jr., John E. Sandmeyer, Newark.

CHAMBERSBURG, PA.—Plans have been completed for the removal of the Quincy Engine Co., Quincy, Pa., to Chambersburg. A bond issue of $15,000 is expected to be authorized by the stockholders for the purchase of the T. B. Woods Sons Co.'s plant. The engine company builds compressed air machinery.

JOHNSTOWN, PA.—The Cronger Co. has been incorporated to manufacture lubricating devices from brass; $15,000 capital stock; by Harry R. Geer, Dennis A. Cronin and H. B. Marnhart.

NEW CASTLE, PA.—The Woods & Golder Construction Co. has been incorporated; $10,000 capital stock; by Henry S. Golder, Frank R. Woods and S. W. Woods.

PHILADELPHIA.—The I. X. L. Pump Co., 961 North Ninth street, has let a contract for the erection of an addition to its factory.

PHILADELPHIA.—The Earle Gear & Machine Co., Stenton and Wyoming streets, has let a contract for the erection of a 2-story, 50 x 120-foot machine shop.

PHILADELPHIA. — The Atlas Ball Co. will let a contract shortly for the erection of a 1-story, 28 x 120-foot blacksmith shop at Twentieth street and Glenwood avenue.

PHILADELPHIA. — The National Ammonia Co., Wissonoming station, has let a contract for the erection of a 1-story experimental laboratory.

PHILADELPHIA.—The Barrett Mfg. Co., Thirty-sixth street and Gray's Ferry road, has let a contract for the erection of a 1-story, 39 x 71-foot addition to be used for the manufacture of roofing material.

PHILADELPHIA.—The Harrison Bros. & Co., Thirty-sixth street and Gray's Ferry road, have let a contract for the erection of a 1-story, 40 x 150-foot addition to the boiler house.

PITTSBURGH.—The Clairton By-Product Co. has been incorporated; $10,000 capital stock; by E. C. McHugh, A. A. Garroway and L. H. Dierken, Pittsburgh.

PITTSBURGH.—Pitt Chemical Co. has been incorporated; $10,000 capital stock; by James F. Scott, Connellsville, Frank H. Scott, Battle Creek, M. T. O'Neill, Pittsburgh.

PITTSBURGH. — The Pittsburgh Knife & Forge Co. has purchased property adjacent to its plant and will double its capacity at an early date.

PITTSBURGH.—The R. H. Brownlee Laboratories has been incorporated; $10,000 capital stock; by Roy H. Brownlee, J. A. Beck, Pittsburgh; Paul A. Stuart, Cheswick, Pa.

PITTSBURGH.—The Morgantown & Wheeling railroad plans to build a line to serve southwestern Pennsylvania and the West Virginia coal fields. The road will connect Wheeling and Morgantown.

PITTSBURGH.—A deal authorizing the construction of a bridge across the Ohio river from Woods run, Pittsburgh to McKees Rocks, has been favorably voted upon by the house of representatives.

READING, PA.—The Berks Engineering Co. is having plans prepared by George L. Gerhard, architect, 619 Penn street, for a 1-story, 54 x 68-foot, and a 2-story, 34 x 50-foot, factory addition.

WILKINSBURG, PA.—The Mack Foundry & Machine Co. has been incorporated; $10,000 capital stock; by A. C. Mack, S. D. Clark and John N. Paterson, Wilkinsburg.

WILMINGTON, DEL. — The car barns, machine shops, etc., belonging to the Tidewater Power Co., were badly damaged by fire. Machinery valued at about $12,000 was destroyed.

Activities in the Central States

CINCINNATI.—A modern garage building, capable of housing 1,000 automobiles, will be built on the site of the old Burnett House, at Third and Vine streets.

CINCINNATI.—The Cincinnati Gear Co. has purchased a site 100 x 150 feet adjoining its plant on Reading road, and will build an addition which will double its present capacity.

CINCINNATI.—The C. M. Robinson Co. has been incorporated to manufacture refrigerating machinery; capital stock $10,000; by C. C. Mussina, C. M. Robinson, E. W. Townsley, M. C. Townsley and Arthur Wood.

CINCINNATI.—The Oakley Machine Tool Co. has been incorporated with a capital stock of $40,000 to build machine tools. The company has been operating for six months in Oakley, a suburb. L. E. Voorheis will be the active head of the plant. The incorporators are George Haydock, Joseph L. Lackner, Joseph S. Graydon and L. E. Voorheis.

CLEVELAND.—The Perfection Spring Co. recently purchased two additional lots for the enlargement of its plant on East Sixty-fifth street.

CLEVELAND.—The S. & M. Welding Co. has been incorporated; $4,000 capital stock; by W. H. Luther, Margaret D. Nooy, C. W. De Nooy, Eugene L. De Nooy and Marcella De Nooy.

CLEVELAND.—The J. D. Farasey Mfg. Co. has been incorporated to manufacture boilers, tanks and furnaces; $40,000 capital stock; by M. F. Farasey, James Farasey, George A. Farasey and William Carey.

CLEVELAND.—The Crescent Brass Mfg. Co. has filed plans for the erection of a $14,000 addition to its plant which is to be erected at West 110th street and the Nickel Plate railroad. The building will be of concrete and brick, 50 x 138 feet.

DAYTON, O.—The Vulcan Tool Co. has been incorporated; capital stock $10,000; by L. I. Heuer, G. W. Lott, C. D. Henderson and I. F. Craig.

DAYTON, O. — The Sheffield Machine & Tool Co. has been incorporated; $25,000 capital stock; by H. Orrin Jones, Joseph H. Carr, Victor Y. Smith, B. Burns and Barry S. Murphy.

DAYTON, O.—A contract for the erection of piers and abutments for the West Carrolton bridge has been awarded to Shook & Boot, Youngstown. Work on the project will begin at an early date.

HAMILTON, O. — The Champion Coated Paper Co. has taken out a permit for the erection of a 4-story addition to its plant.

TIFFIN, O.—The Economy Motor Co. has been organized by Raymond W. Miller, John A. Manacke and George E. Schroth, director of the Allen Motor Co., Fostoria, for the purpose of building a light motor truck. Manufacturing operations will be carried on in the Tiffin Woolen mills which will be remodeled for this purpose.

TOLEDO, O.—The City Machine & Tool Co. has been incorporated; $10,000 capital stock; by Amos Lint, R. D. Logan, Frank O'Neil, K. M. Boblett and M. M. Lint.

TOLEDO, O.—The Kasle Iron & Metal Co. has been incorporated; $10,000 capital stock; by Sam Kasle, Joe Kasle, Hannah N. Kasle, A. L. Mayer and David B. Eppstein.

CLARKSBURG, W. VA.—The city of Clarksburg will receive bids April 1 on the erection of a 1-story brick and reinforced concrete pumping station, 40 x 60 feet, plans for which have been prepared by George W. Fuller, 170 Broadway, New York City.

FAIRMONT, W. VA.—The city of Fairmont plans to build a reinforced concrete bridge across the Monongahela river, to cost $350,000. S. B. Miller, city engineer, is preparing the plans.

MEADOW BROOK, W. VA.—The Grasselli Chemical Co. plans, it is reported, to enlarge its plant at Meadow Brook.

ANDERSON, IND. — Bids will be taken about April 1 by C. D. McLane, Rock Island, Ill., architect, for a Y. M. C. A. building to cost $200,000.

BLOOMINGTON, IND.—The county clerk will let a contract, probably in July for constructing steel bridges for the county to cost $10,000.

CRAWFORDSVILLE, IND. — The Umphrey Mfg. Co. has been incorporated to manufacture iron, steel and wooden specialties; $150,000 capital stock; by L. C. Umphrey, W. A. Umphrey and C. L. Goodbar.

FORT WAYNE, IND.—Officials of the local plant of the General Electric Co. announce

that four new buildings will be erected during the summer. One of the buildings will have 275,000 feet of floor space. The company authorized an appropriation of $1,000,000 for the construction of the buildings two years ago.

INDIANAPOLIS, IND. — The American Valve & Tank Co., Indianapolis, has announced an increase in capital from $50,000 to $100,000.

INDIANAPOLIS, IND.—The Grayson Tool Mfg. Co. has been incorporated with an authorized capital of $50,000. The directors are J. H. Grayson, and B. W. Simpson.

INDIANAPOLIS, IND. — The Deeds Commercial Laboratories have been incorporated to manufacture a composition to be used in case-hardening steel; $10,000 capital stock; by Paul O. Deeds, Baird G. Saltzgaber and P. F. Davidson.

INDIANAPOLIS, IND. — The Marshall-Huschart Machinery Co. has been given papers of incorporation to engage in the building of machinery at Indianapolis. The capitalization is $50,000. The directors are G. W. Hurd, O. S. Hunt, and Murray Shipley.

MUNCIE, IND.—The Warnet Co. of Muncie, has been issued incorporation papers to engage in the manufacture of metal automobile parts. The capitalization is $10,000. The directors are Norman L. Werner, Abraham C. Lipsitz, and Leo D. Pangborn.

SOUTH BEND, IND.—The Holland Machine Co. of South Bend has changed its name to the Sibley Machine Co.

TERRE HAUTE, IND.—The A. & K. Mfg. Co. has been incorporated to manufacture iron and steel products and automobile parts. The directors are Otis B. Katman, Earl G. Alspaugh, and Frank A. Katman.

CHAMPAIGN, ILL.—The Illinois Traction Co., G. M. Mattes, vice president, Champaign, is considering the construction of an interurban line between Champaign and Bloomington, about 50 miles.

CHICAGO.—The Vacuum Motor Mfg. Co. has been incorporated; $2,500 capital stock; by George E. Brannan and Frank A. Urwan, 20 West Jackson boulevard.

CHICAGO.—The Western Iron Construction Co. has been incorporated; $5,000 capital stock; by M. J. Mears, R. H. Crackel and Niels Buck, 6525 North Clark street.

CHICAGO.—The Swift Machine Co. has been incorporated; $1,000 capital stock; by A. V. Miller, E. W. Rogers and E. A. Rogers, 327 South LaSalle street.

CHICAGO.—The Rex Pump Co. has been incorporated; $10,000 capital stock; by Abram Z. Zietlein, Robert Elson and Hyman Soboroff, 159 North Clark street.

CHICAGO.—The Marvel Steel Products Co. has been incorporated; $25,000 capital stock; by John C. Lelger, Daniel F. Ramsey and Theodore F. Ehler, 712 West Thirty-third street.

MT. CARMEL, ILL.—Leon H. Murray, engineer of the Oil Belt railroad, and B. H. Kamp are interested in a project to establish a power plant on the Wabash river at Mt. Carmil.

WAUCONDA, ILL.—The board of local improvements has authorized a waterworks system to cost $15,000.

DETROIT.—The National Can Co. is building a 3-story factory, 62 x 92 feet.

DETROIT.—August C. Fruehauf, manufacturer of automobile bodies, is building a 2-story factory, 50 x 164 feet, to cost $5,000.

DETROIT.—The Marx Brass Co. is having plans prepared for a brass foundry and machine shop, 60 x 155 feet.

DETROIT.—E. J. Woodison Co. will build a 2-story plant at East Grand boulevard and Saint Aubin avenue for the manufacture of fire-brick.

FLINT, MICH.—The J. B. Armstrong Co., manufacturer of steel springs, is building a 1-story factory, 78 x 132 feet and 26 x 127 feet.

LANSING, MICH.—The Novo Engine Co. will build a factory for which bids will be asked at an early date.

IONIA, MICH.—The Ypsilanti Reed Furniture Co. will build a power plant costing $20,000. Wernette, Bradfield & Mead, Grand Rapids, Mich., are the architects.

Stampede!

A Few of These Live News Items Into Your Corral and Rebrand Them "Sold." They All Bear the O. K. Mark.

The National Tube Co., Pittsburgh, is in the market for 15 to 20 electric cranes with capacities of 15 to 125 tons for installation in the company's plant which will be erected at Gary, Ind.

The Standard Seamless Tube Co., Pittsburgh, is receiving bids on the following cranes: one 10, 15, 30 and 50-ton machines.

The Donner Steel Co., Buffalo, is in the market for a 15-ton crane.

The Cobourg Felt Co., Cobourg, Ont., is in the market for a 16-inch engine lathe, having 4 to 6 feet between centers.

W. L. Gilman, care of the Brown Corporation, La Tuque, Que., is in the market for a 10x12 standard, double-cylinder, double-drum donkey engine.

The Brunelle Furnace & Boiler Co., Yamachiche, Que., will install electric motors and considerable auxiliary equipment in its plant. A. Heroux is the manager.

The Joliette Steel Co., Joliette, Que., is building an extensive addition to its plant and will be in the market shortly for steam and electric power equipment.

Kerry & Chace, 550 Confederation Life building, Toronto, are in the market for the following equipment to be delivered to the Cordova Mines, Ont.: One alternating current, 60-cycle, 3-phase, 6,600-volt, 300 to 600-kilowatt-volt-ampere generator; three single phase, 60-cycle, 6,600 to 600-volt, 100-kilowatt-volt-ampere, step-down transformers; two belted induction or synchronous, 300 to 400-horsepower, 3-phase, 60-cycle, 6,600-volt motors; two air compressors, with a capacity of 2,000 cubic feet each under 100 pounds pressure, belt-driven; one Lydner drill sharpener. All information, prices and inquiries should be addressed to Kerry & Chace.

BELOIT, WIS.—The Warner Auto Trailer Co. has leased the J. Thompson's Sons Mfg. Co. plant and will begin operations as soon as equipment is installed.

CHIPPEWA FALLS, WIS.—The Chippewa Foundry & Machine Co. has announced that additional machinery will be installed to double output of the plant. The company manufactures pumps.

EAU CLAIRE, WIS. — The Eau Claire Mfg. Co. has been incorporated to manufacture a motor plow and farm tractor; $75,000 capital stock; by R. B. Gillette, G. R. Wood and M. S. Opseta.

EAU CLAIRE, WIS.—The Laursen Automatic Pump Co. is planning to build a foundry in connection with the Globe Iron Works, Menomonie, which was recently taken over. This will allow all parts to be manufactured at the same plant. L. A. Laursen, Menomonie is the president.

HARTFORD, WIS.—The Kissell Motor Car Co. will build an addition. Robert A. Messmer & Bros., 1004 Majestic building, Milwaukee are the architects.

JANESVILLE, WIS.—The Janesville Tractor Engine Co., recently organized, to manufacture tractors and gasoline engines, will build and equip a plant.

MADISON, WIS.—The Brown-Schefrin Co. has been organized to deal in metals; $20,000 capital stock; by R. E. Locher, Samuel Schefrin and Lee F. Saltzstein.

MILWAUKEE.—The Fisher Brass Foundry, 228 Muskego avenue, has recently started operations in a foundry just completed.

MILWAUKEE.—The Crary Tool Co. has been incorporated to manufacture chisels, pliers, wrenches and other tools; $30,000 capital stock; by John M. Hoerl, John Haubert and George E. Garent.

OAKFIELD, WIS.—The Ewald Works, recently incorporated with $20,000 capital stock, will build a garage and machine shop, requiring a small amount of equipment.

RACINE, WIS.—The Badger Foundry Co. has been bought by Anges R. Callender, formerly chief clerk of the manufacturing department of the J. I. Case Threshing Machine Co.

RHINELANDER, WIS. — The Rhinelander Light & Power Co. has increased its capital stock from $100,000 to $125,000, to provide for enlargements.

STEVENS POINT, WIS.—The Central Iron Works, which recently undertook the manufacture of trucking devices for shops, factories, etc., is enlarging this division. The company has received an order for 60 trucks for the Automatic Cradle Mfg. Co., Stevens Point, which is about to double the size of its plant.

STEVENS POINT, WIS.—John J. Bukolt, manufacturer of steel tire protectors and other automobile devices, is organizing a new corporation, to be capitalized at $100,000. A factory affording 15,000 square feet of floor space will be erected in the spring. The Automatic Cradle Mfg. Co. is planning to build a 3-story addition, 82 x 150 feet, a new dry kiln and an office building. The company is buying a considerable quantity of wood and metal working machinery.

CARUTHERSVILLE, MO.—The Electric Light & Power Co. will increase its capital to $15,000 to provide for extensions.

GORIN, MO.—Piles & Brown will make improvements to their electric plant including a boiler, engine and generators.

KANSAS CITY, MO.—The Star Brass Works Co. has leased a 75 x 125-foot tract at 2623 McGee road and has erected a 2-story plant on the site. This building will be ready for occupancy at an early date. The company manufactures brass specialties for motor cars as well as a general line of metal commodities.

ST. LOUIS.—The St. Louis Frog & Switch Co. will build an addition to its plant at its Wellston station, St. Louis.

ST. LOUIS.—The Wagner Electric Mfg. Co. has increased its capital stock from $1,800,000 to $2,000,000 and will build an addition to its plant at a cost of $100,000.

ST. LOUIS, MO.—The St. Louis Sand Blast & Construction Co. has been incorporated to carry on business as a general con-

tractor; $3,000 capital stock; by E. M. Schafer, Louis Schafer, James E. Carroll.

FORT MADISON, IA.—The Acme Chandelier & Mfg. Co. has been incorporated; $50,000 capital stock; by W. S. Scherfe and B. F. Schreves.

MARSHALLTOWN, IA.—The county supervisors will spend $75,000 to $100,000 on bridges this year, 75 new bridges and culverts being planned. W. W. Morehouse is the county engineer.

SHELDON, IA.—The Northern Iowa Power Co. has bought the plant of the Sheldon Light & Power Co. and will spend $60,000 in improvements.

SIOUX CITY.—Theodore Christenson, 2306 Tenth street, is building a foundry 40 x 50 feet, to cost $2,500.

DULUTH.—The Hugo Mfg. Co. is in the market for a 10-ton and 20-ton drawing press, a power squaring shear, a universal milling machine, and electric welding machine, an air compressor, a riveting machine and several electric motors.

MINNEAPOLIS.—The Minneapolis Steel & Machinery Co. has taken out a permit to erect a series of additions, the total expenditure for which amounts to about $20,000.

SPOONER, MINN.—The Canadian Northern railroad will build a bridge over the Baudette river. Plans are being prepared by the company engineers at Winnipeg.

ST. PAUL.—The Graham Valve Co., of Detroit, is planning to build a foundry at St. Paul costing $100,000.

ST. PAUL.—B. W. Harris will build a factory costing $350,000 for the manufacture of gas engines.

ST. PAUL, MINN.—The Minnesota Furnace Supply Co. has bought a site and will build a factory.

WINONA, MINN.—The Wisconsin Railway Light & Power Co., R. M. Howard, manager, Winona, will build a power house and electric light plant, 1-story, 55 x 90 feet, to cost $200,000. Woodmansee & Davidson, 38 South Dearborn street, Chicago, are the engineers.

In the South and Around the Gulf

MERIDIAN, MISS.—The Meridian & Memphis railroad, S. A. Neville, Meridian, vice president, will build 13 miles of line from Union to Sebastopol.

KNOXVILLE, TENN. — The Dixie Gray Marble Co., $50,000 capital, will equip its plant with marble quarrying machinery and will buy a steel derrick, hoisting engine, boiler, channeler, drills, air compressor, etc. Address Box 609. H. B. Lindsay and W. J. Donaldson are interested.

BARBOURVILLE, KY.—The Cumberland Natural Gas Co. is reported to be planning a refinery in Barbourville.

LOUISVILLE, KY.—The Southern Fire Apparatus Co., incorporated with $33,000 capital, will represent fire machinery manufacturers, later expecting to manufacture. E. R. Jennings, Inter-Southern building, is interested.

LOUISVILLE, KY.—The Louisville Steel & Iron Products Co. has been incorporated with $1,125,000 capital to buy the plant of the Louisville Bolt & Iron Co. and carry on the manufacture of sheet steel and bar iron. O. C. Carter, Chicago, is president and George H. Holzbog, Louisville, is secretary-treasurer.

MAYFIELD, KY.—A gas manufacturing plant is projected. W. A. Calhoun, Paducah, is the consulting engineer.

OWENSBORO, KY. — The International Farm Implement Co. has been incorporated with $100,000 and will assemble parts of a patent ditcher and grader and disc harrow, later purposing to erect a plant in Owensboro. W. E. Smith and others are interested.

WINCHESTER, KY.—The city council voted to take over the plant and property of the Winchester Waterworks Co. E. B. Kay, Tuscaloosa, Ala., has been chosen to appraise the property and estimate the cost of proposed betterments.

DEQUEEN, ARK.—The DeQueen Ice & Light Co. will install two oil engines to give 125 horsepower, at a cost of $20,000.

GURDON, ARK.—Richard Schwartz, of Hot Springs, has been granted a 25-year franchise for an electric light and power system and will install two generating units belted to oil engine.

LITTLE ROCK, ARK. — The Arkansas Light & Power Co. will issue $5,000,000 in bonds to buy other plants and make extensions.

BATON ROUGE, LA.—The Standard Oil Co. is negotiating for the purchase of 160 acres upon which a $2,000,000 refinery addition will be built. This extension will house about 100 high-pressure stills.

GALVESTON, TEX.—Plans have been approved for a new causeway, providing 28 additional arches of 70-foot spans, other arches being 50-foot spans. The estimated cost is about $1,646,000. R. M. Sies is the county engineer.

GALVESTON, TEX.—The Houston Ice & Cold Storage Co. has let a contract to John Egbert, Galveston, for a brick and reinforced concrete, 120 x 128-foot, 1-story, ice and cold storage plant. The structure will cost about $30,000. The plans and specifications were prepared by Cooke & Co., Galveston.

HEREFORD, TEX.—The Hereford Electric Light & Power Co. will install equipment, including a 125-horsepower return tubular boiler and 50-kilowatt steam-driven generating unit.

HOUSTON, TEX.—The Houston & San Antonio Interurban railroad will start soon on a 225-mile line from Houston to San Antonio. The first section will be from San Antonio to Sequin, 30 miles.

SAN ANTONIO, TEX.—The San Antonio Machinery & Supply Co. has increased its capital stock from $300,000 to $400,000.

SAN ANTONIO, TEX. — The San Antonio Gas & Electric Co. is to spend $150,000 on its B plant to increase its output.

SAN ANTONIO, TEX.—A contract will be let soon for a roundhouse and shops for the International & Great Northern railroad, costing $300,000 to $400,000. C. H. Crittenden is chief engineer.

ARDMORE, OKLA.—This city plans to build a hydro-electric plant on Washita river, 14 miles from the city of Ardmore, to cost $375,000. J. H. Kurlock is the city engineer.

OKLAHOMA; OKLA.—The Sharpe Motor Car & Body Co. will build a factory for the manufacture of automobile bodies.

OKLAHOMA, OKLA.—The Lightning Machinery Co. has been incorporated to build a machine shop and foundry; $15,000 capital stock; by Edward Goodwin and George Pladger, Oklahoma City and H. H. Hinkle of DeVol, Oklahoma.

OKLAHOMA CITY, OKLA.—The Canadian Valley Bridge & Construction Co. has been incorporated; $200,000 capital stock; by H. R. Mitchell, Oklahoma City, James F. Wright, New Castle, Okla., George D. Key, Tulsa, Okla., and John Praning, Norman, Okla.

Pacific Coast and Western Canada

SAN FRANCISCO.—Construction has been started on a 6-story automobile depot and repair shop, 120 x 240 feet, to cost $400,000, for J. W. Leavitt & Co., at Bush street and Van Ness avenue.

SANTA BARBARA, CAL.—Bids will be received until April 7 by the county supervisors for two reinforced concrete girder bridges to cost $11,500.

SEATTLE, WASH.—The Elliott Bay Yacht & Engine Co. will erect a ship building plant at Chelan avenue, including a 200 x 260-foot dry dock and a 60 x 100-foot gridiron machine shop.

WHITESON, ORE.—The Southern Pacific railroad, W. Hood, chief engineer, San Francisco, Cal., will start work shortly electrifying the west side line from Whiteson to Corvallis, 40 miles.

VANCOUVER, B. C.—The Mainland Engineering Co. has been incorporated to carry on a general engineering business, to build machinery, tools, etc.; $50,000 capital stock.

CALGARY, ALTA.—J. C. Boyle will commence at once on the erection of a packing plant at Calgary to cost $1,000,000.

CALGARY, ALTA. — The Riverside Iron Works is in the market for a 7½ or 10-horsepower direct-current, 220-volt, electric motor with either pulley or gear drive.

CALGARY, ALTA.—The city council will spend $36,438 for powerhouse switching installation and $15,000 for electric light and power connections. J. M. Miller is clerk to the council.

CALGARY, ALTA.—The West End Incinerator plant at Calgary was damaged by fire with a loss of $50,000.

TOPEKA, KAS.—Bids will be received soon for a blacksmith shop for the Santa Fe railroad at Topeka, to cost $70,000. C. F. W. Felt, Chicago, is the chief engineer.

PIERRE, S. D.—The Missouri River Power Co. has been incorporated; $1,000,000 capital stock; to develop electric power at Big Bend near Pierre. J. E. Mallery is one of the incorporators.

TUCSON, ARIZ.—The University of Arizona will install a light, heat and power plant at a cost of $50,000.

New Business in Eastern Canada

EMERSON, MAN.—The town council will build an electric lighting plant at Emerson. W. W. Unsworth is clerk to the council.

BEAVERTON, ONT.—The Beaverton Toy & Foundry Co. has been incorporated to manufacture all kinds of goods, $600,000 capital stock; by Benjamin Madill, John P. Heaslip, Alfred Smith and others of Beaverton.

BERLIN, ONT.—The Regal Auto Co. is preparing to erect a new automobile factory having sold its present plant to Doon Twine Co., of Doon, which will remove from that town to Berlin.

BRAMPTON, ONT.—Frank D. Law is interested in a company which is contemplating the erection of a factory for the manufacture of rubber goods, tires, etc.

FORT ERIE, ONT.—The International Safe Co. will build an addition to its plant.

HAMILTON, ONT.—The United Gas & Fuel Co. announces that it will build coke ovens at Hamilton to cost $2,000,000.

HAMILTON, ONT.—The Frost Steel & Wire Co. has been incorporated to manufacture fences, gates, posts, and other wire goods, etc.; $6,000,000 capital stock; by H. L. Frost, A. L. Pope and C. A. Smith of Hamilton, Ont.; Richard Harcourt of Welland, Ont., and others.

HAMILTON, ONT.—The Jewel Mfg. Co., Ltd., has been incorporated to build paper presses, machinery, tools, etc. $10,000 capital stock; by Harry H. Hannon and Albert M. Boyington of Hamilton; Arthur McConvry, John S. McConkey and others of London, Ont.

HAMILTON, ONT.—The Ontario Yarn Co. of Markham, Ont., will establish a branch plant in Hamilton, where it has secured a building which will be fitted up with new equipment, including carding, spinning and winding machinery of the value of about $20,000.

LONDON, ONT.—The A. A. Langford Co. will build a factory at the corner of Clarence & King streets to cost $40,000.

LONDON, ONT. — The city council will purchase an asphalt plant. H. A. Brazier is the engineer.

LONDON, ONT.—The London Foundry Co. will build an addition to its plant to cost $10,000. E. Grobbis manager of the company.

LONDON, ONT.—The Utility Electric Mfg. Co., Ltd., has been incorporated to manufacture electric stoves, ranges, heaters, machinery, etc.; $40,000 capital stock; by Robert J. Gracey, John Sussex, James A. Ross and others, all of London.

LONDON, ONT.—Beemer & Co., Ltd., has been incorporated to build automobiles, engines, motors, vehicles of all kinds, etc.; $35,000 capital stock; by John C. Beemer, Frank D. McLachlin and others, all of London

MONTROSE, ONT.—The Michigan Central railroad, of Detroit, will build a roundhouse, coal docks, etc., at Montrose to cost $250,000. Work will be started at an early date on the construction of the buildings.

MOUNT BRYDGES, ONT.—The Canadian Crow-Elkhart Motor Co. is considering enlarging its plant. John Stuart is the manager.

NIAGARA FALLS, ONT. — The Pollard Mfg. Co. will build an addition to its plant and install new machinery to build machinery, iron, steel, vaults, etc.

OSHAWA, ONT.—The Bryant Mfg. Co. will build a factory at Oshawa.

OTTAWA, ONT.—The plant of the Ottawa Steel & Iron Works, 137 Broad street was damaged by fire with a loss of $4,000. The plant will be rebuilt immediately.

OTTAWA, ONT.—The city council will have a pump house and substation constructed on Lemieux island to cost $86,000. Thomas McLaughlin, Ottawa, Ont., is the contractor.

RENFREW, ONT.—Fire damaged the mill house at the plant of O'Brien Munition, Ltd. The loss is estimated at $100,000.

SAINT MARYS, ONT.—Bids will be received until March 31 by the superintendent of the water works department for a 2,000,000-gallon centrifugal pump.

TORONTO, ONT.—The John V. Gray Construction Co., Ltd., has been incorporated to carry on a general construction business, to build railways, harbors, piers, etc.; by John V. Gray, 59 Marmaduke street, Joseph A. Legris, Robert Wherry and others of Toronto.

TORONTO, ONT.—The Toronto Chemical Co., incorporated under the laws of Nova Scotia, has been authorized to carry on business in Ontario as manufacturer and refiner of benzol and other hydro-carbons with a capital not exceeding $150,000.

TORONTO, ONT.—The Doty Engine Co. has been incorporated to build machinery, boilers, engines, tools, iron, steel, etc. $100,000 capital stock; by William Bain, care of Blake, Lask, Anglin and Cassels, 25 King street west; James S. Lovell, 119 Madison avenue; John S. Dashwood, 484 Kingston road, and others, all of Toronto.

WALKERVILLE, ONT. — The Canadian Hoskins Co., Sandwich street, Walkerville, will purchase machinery for the manufacture of wire goods, etc., to cost $10,000. R. H. Cunningham is manager of the company.

WELLAND, ONT. — The Union Carbide Co., will build a $20,000 addition to its drum shop.

WINDSOR, ONT.—The citizens of Windsor have adopted a by-law to exempt the Maxwell Motor Co. of Detroit from local taxation on condition of its erecting a factory to cost $65,000.

DRUMMONDVILLE, QUE. — The Aetna Chemical Co., of Canada, will commence work at an early date on the erection of a sulphuric acid plant to cost $300,000.

MONTREAL, QUE.—Plans have been submitted to the board of control for a subway under the Lachine canal on Wellington street, the cost of which is estimated at $1,200,000.

MONTREAL, QUE.—The Canada Metal Mfg. Co.'s plant at St. James and Richmond streets was damaged by fire with a loss of $15,000. The company will rebuild.

MONTREAL.—The Security Engineering & Contracting Co. has been incorporated to build railways, wharves, docks, and to build machinery, tools, etc.; $25,000 capital stock; by A. Valee and others of Montreal.

MONTREAL, QUE.—The Smith Typewriter Co. has been incorporated to manufacture typewriters and supplies; $50,000 capital stock; by Francis H. Turner, Wm. J. Jacot and others of Montreal and Edgar K. Stephenson, Syracuse, N. Y.

MONTREAL, QUE.—The Powers Accounting Machine Co., of Canada, has been incorporated to manufacture adding machines, recording machines, instruments, etc.; $25,000 capital stock; by George W. MacDougall, Lawrence Macfarlane, William B. Scott and others all of Montreal.

MONTREAL, QUE.—The Sovereign Lime Co., Ltd., has been incorporated to manufacture lime, brick, cement, etc.; $50,000 capital stock; by George R. Drennan, Herbert W. Jackson, Michael J. O'Brien and others of Montreal.

MONTREAL, QUE. — The Champagnie Saint-Louis, Ltd., has been incorporated to build electric and steam railways, bridges, dry docks, etc.; $20,000 capital stock; by Louis Langelier, J. B. Hurteau, Victor Langelier and others.

MONTREAL, QUE.—The Gill Motor Co. has been incorporated to manufacture machinery, mechanical specialties, motors, engines, etc. $99,000 capital stock; by Thomas M. Gill of Lewiston, Me., George M. Smyth, Walter Gill and others of Montreal.

MONTREAL, QUE. — The Overland Tire & Rubber Co., Ltd., has been incorporated to manufacture mechanical rubber supplies and rubber tires; $50,000 capital stock; by John J. O'Reilly, Neil F. McNeil, Wm. R. MacKay and others of Montreal.

POINTE AUX TREMBLES, QUE. — The Imperial Oil Co. is erecting a $1,500,000 asphalt refining plant to handle the company's trade for eastern Canada.

QUEBEC, QUE.—The city council will purchase an asphalt plant to cost $12,000 and will also install a filtration plant. W. D. Baillairge is the engineer.

SHAWINIGAN FALLS, QUE.—The Canadian Electrode Co., recently incorporated to manufacture carbon electrodes, etc., is erecting a plant at Shawinigan Falls. This company is controlled by the Shawinigan Water & Power Co., of Montreal, Que.

ST. JEROME, QUE.—The St. Jerome Mfg. Co. will build extensive additions to its plant for which tenders will be called in the near future.

FREDERICTON, N. B.—The Fredericton Gas Light Co. has been taken over by a new syndicate which will make considerable extensions and install new equipment to the plant.

MONCTON, N. B.—The principal building of the Record Foundry & Machine Co. was seriously damaged by fire entailing a loss of about $100,000.

NEW CATALOGS

DUPLEXING AND CENTRIFUGAL PUMPS.—Catalogs have been issued by the A. S. Cameron Steam Pump Works, 11 Broadway, New York, describing duplex and centrifugal pumps. In mentioning the line of duplex pumps considerable stress is laid upon the design of the various types. The levers are forked, giving a double bearing at the crossheads, and insuring reliable valve action. Levers on the larger pumps are fitted with roller bearings in the crossheads. Regular fitted pumps have one-piece steel pistons, and when requested the rod on the water end is furnished in pure Tobin bronze and steel is employed for the rod on the steam end. The steam cylinders of the large pumps are cast separately and are equipped with dash relief valves for regulating the piston stroke. The design is said to afford ready access to the internal parts of the pumps, making repairs and adjustments less difficult. The pumps are manufactured in sizes for a wide range of capacities, speeds, and pressures. The catalog describing centrifugal pumps is devoted entirely to vertical single and double suction pumps adapted to direct motor, steam turbine, gas or oil engine, or belt drive.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Lower price to July 1; higher to Jan. 1.)

Bessemer, valley	$20.50 to 21.00
Bessemer, Pittsburgh	21.45 to 21.95
Basic, Pittsburgh	19.45
Basic, eastern Pa.	19.75 to 20.25
Basic, Buffalo	20.00
Malleable, Pittsburgh	19.45 to 19.95
Malleable foundry, Chicago	19.00
Malleable foundry, Philadelphia	21.50 to 21.75
Malleable foundry, Buffalo	18.50 to 19.00
No. 1X foundry, Philadelphia	20.50 to 20.75
No. 2 foundry, Pittsburgh	19.45 to 19.95
No. 2 foundry, Cleveland	19.00
No. 2 foundry, Ironton	18.50 to 19.00
No. 2 foundry, Chicago	18.50
No. 2X foundry, Philadelphia	20.00 to 20.50
No. 2X foundry, N. J. tidewater	20.00 to 20.50
No. 2X foundry, Buffalo	18.50 to 19.00
No. 2 plain, Philadelphia	19.50 to 20.00
No. 2 plain, N. J. tidewater	19.50 to 20.00
No. 2 plain, Buffalo	18.00 to 18.50
No. 2 southern, Birmingham	15.00 to 15.50
No. 2 southern, Cincinnati	17.40 to 17.90
No. 2 southern, Chicago	19.50 to 20.00
No. 2 southern, Phila. delivery	20.00 to 20.50
No. 2 southern, Cleveland	19.00 to 19.50
No. 2 southern, New York docks	19.00 to 19.50
No. 2 southern, Boston docks	19.25 to 19.75
No. 2 south. interior, New Eng.	20.00 to 21.00
No. 2 southern, St. Louis	18.40 to 18.90
Virginia No. 2X furnace	18.00
Virginia 2X, Philadelphia	20.75
Virginia 2X, Jersey City	21.00
Virginia 2X, Boston points	21.25
Gray forge, eastern Pa.	18.50 to 19.00
Gray forge, Pittsburgh	18.95
Gray forge, Birmingham	14.00 to 15.00
Silveries, 8 per cent, furnace	26.00 to 27.00
Silveries, 8 per cent, Chicago	29.50
Low phos. Standard, Phila.	32.00
Low phos. Lebanon, Pa.	29.00 to 31.00
Low phos. Pittsburgh	30.00 to 31.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	19.75 to 22.25
Charcoal, Buffalo	19.00 to 20.00
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.

(Lower Lake Ports.)

Old range Bessemer, 55 per cent, ton	$4.45
Mesabi Bessemer, 55 per cent, ton	4.20
Old range non-Bes., 51½ per cent, ton	3.70
Mesabi non-Bess., 51½ per cent, ton	3.55

Eastern Ores.

(Per unit delivered eastern Pennsylvania.)

Pt. Henry fur., 60 per cent, unit.	8.6c to 8.9c
Local N. Y. and N. J. ores, unit.	8.5c to 8.75c
Port Henry lump, at mines, ton.	$4.00

Foreign Ores.

(Per unit Philadelphia.)

(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½
For'n non-Bess., 50 to 65 per cent	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$3.50 to 3.75
Connellsville fur., contract	3.00
Connellsville foundry	3.50 to 3.75
Connellsville fdy. contract	4.00
Wise county furnace, contract	2.85 to 3.25
Wise county foundry, contract	3.50 to 3.75
Pocahontas foundry, contract	3.25 to 3.75
Pocahontas furnace, contract	2.85 to 3.25
New River, foundry contract	3.75 to 4.25
New River, furnace contract	3.25 to 3.50

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., delivered (prompt).	$300 to 350
Ferro mang., Balti., (future)	175
Spiegelensen 20 per cent, last half	60.00
Ferro-silicon, 50 per cent, Phila.	83.00 to 85.00
Ferro silicon, 50 per cent, Pbgh.	83.00 to 85.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $30.00; 10 to 11 per cent, $31.00; 11 to 12 per cent, $32.00; 12 to 13 per cent, $33.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 25 cents per pound; 2 per cent carbon, nominal.

Ferro-vanadium, nominal, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, nominal.

Ferro-tungsten, nominal.

Cobalt metal, nominal, Pittsburgh.

Aluminum, nominal, Pittsburgh.

Ferry-molybdenum, Pittsburgh, nominal.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive for insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

SEMI-FINISHED MATERIAL

Open hearth billets, Phila.	$45.00 to 50.00
Forging billets, Phila.	55.00 to 65.00
Forging billets, Pbgh., nominal.	55.00 to 65.00
Forging billets, Chgo.	55.00 to 60.00
Wire rods, Pittsburgh (nom.)	50.00 to 60.00
Bessemer billets, Youngstown	40.00
Bessemer billets, Pittsburgh	40.00
Open hearth billets, Pittsburgh	40.00
Open hearth billets, Youngstown	40.00
Bess. sheet bars, Youngstown	40.00
Op. h'th sheet bars, Youngstown	40.00
Bess. sheet bars, Pittsburgh	40.00 to 42.00
Open h'th sh. bars, Pbgh.	40.00 to 42.00
Muck bar, Pittsburgh (nominal).	40.00

SKELP

Grooved steel skelp	2.25c
Sheared steel skelp	2.35c

RAILS AND TRACK MATERIAL

Stand. Bess. rails, Pbgh. & Chg.	1.25c
Stan. op-h'th rails, Pbgh. & Chg.	1.34c
Light rails, 8 to 10 lbs., Pbgh.	1.85c
Light rails, 8 lb., Chgo.	1.76c
Light rails, 12 to 14 lbs., Pbgh.	1.80c
Light rails, 12 lbs., Chgo.	1.71c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—

Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18

Buffalo to:—

Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Broklyn (by canal)	1.25 to 1.60

Virginia furnaces to:—

Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88

Birmingham, Ala., to:—

Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (r. and w.)	4.25
Philadelphia (all rail)	5.20
Philadelphia (r. and w.)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75

Chicago to:—

Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58

Ironton and Jackson, O., to:—

Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

Light rails 16 to 20 lbs., Pbgh.	1.75c
Light rails 16 to 20 lbs., Chgo.	1.66c
Light rails 25 to 45 lbs., Pbgh.	1.70c
Light rails 25 to 45 lbs., Chgo.	1.61c
Relaying rails, standard, Pbgh. and Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect., Pbgh., base	1.50c to 1.75c
Angel bars, st. sections, Chgo.	1.50c to 1.75c
Spikes, railroad, Pbgh.	2.50c to 2.65c
Spikes, railroad, Chgo.	2.60c to 2.75c
Track bolts, Pbgh.	3.25c
Track bolts, Chgo.	3.25c to 3.50c
Tie plates, Chgo.	45.00 to 48.00

SHAPES, PLATES AND BARS

Structural shapes, Pbgh.	2.50c
Structural shapes, Pbgh. (con.)	2.35c to 2.50c
Structural shapes, Chgo.	2.54c to 3.04c
Structural shapes, Philadelphia	2.409c to 2.659c
Structural shapes, New York	2.419c to 2.669c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chgo.	2.79c to 3.19c
Tank plates, Pbgh. (con.)	2.60c to 2.75c
Tank plates, Pbgh.	2.75c to 3.25c
Tank plates, Philadelphia	2.909c to 3.659c
Tank plates, New York	2.919c to 3.669c
Bars, soft steel, Chgo.	2.54c to 3.04c
Bars, soft steel, Pbgh. (con.)	2.35c to 2.50c
Bars, soft steel, Pbgh.	2.50c
Bars, soft steel, New York	2.419c
Hoops, carloads, Pbgh.	2.50c to 2.75c
Bands, Pittsburgh	2.35c
Shafting, Pbgh., contr. carloads	25 off
Bar iron, Chgo.	2.25c
Bar iron, Philadelphia	2.559c
Bar iron, New York	2.569c
Bar iron, Cleveland	2.25c
Bar iron, Pittsburgh	2.40c to 2.50c
Hard steel bars, Chgo.	2.25c to 2.35c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	2.75c to 2.85c
No. 28, black, Chgo.	3.04c to 3.29c
No. 28, tin mill, black, Pbgh.	2.70c to 2.80c
No. 28, galvanized, Pbgh.	4.75c to 5.25c
No. 28, galvanized, Chgo.	5.19c
No. 10, blue anl'd, Pbgh.	2.90c to 3.00c
No. 10, blue anl'd, Phila.	3.059c to 3.559c
No. 10, blue anl'd, Chgo.	3.09c to 3.34c
Tin plate, 100 lb., coke base	$4.00 to 4.50

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickl'd, cold roll. and re-anld.	30 cents
Hot roll'd pickled and anl., tin mill.	25 cents
Full pickled, cold rolled and re-anld.	50 cents
Auto sheets	75 cents
Blue stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel, free from mill scale	80 cents
Extra deep special auto body stock.	1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black. Butt-weld.	Galv. Butt-weld.
Steel ¾ to 3 inches	74	57½
Iron, ¾ to 1½ inches	61	41
	Lap-weld.	
Steel, 2½ to 6 inches	73	56½

BOILER TUBES

Steel, 3½ to 4½ inches, l. c. l.	62
Iron, 3½ to 4½ inches, l. c. l.	51

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotations.)

Wire nails, jobbers', Pittsburgh	$2.40
Plain wire, jobbers', Pittsburgh	2.25
Galvanized wire, jobbers', Pbgh.	2.95
Polished staples, Pbgh.	2.55
Galvanized staples, Pbgh.	3.25
Barb wire, painted, jobbers', Pbgh.	2.55
Barb wire, galv., jobbers', Pbgh.	3.25

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled thread, 65 and 5, cut threads 65; larger or longer, 50 and 15.

Machine bolts with hot pressed nuts, ⅜ x 4 inches, smaller or shorter, rolled 65 and 10; cut, 65 and 5; larger or longer, 50 and 20.

Cold pressed, semi-finished hexagon nuts, 75 and 10.

Gimlet and cone point lag bolts, 65, 10 and 5. Hot pressed square, blank or tapped nuts, $3.70 off list; hot pressed hexagon blank or tapped, $3.80.

Cold pressed square, blank or tapped, $3.50 off; hexagon, blank or tapped, all sizes, $4.25.

RIVETS

Structural rivets, Pbgh	3.15c
Structural rivets, Chgo. delivery	3.30c
Boiler rivets, Pbgh	3.25c
Boiler rivets, Chgo. delivery	3.40c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	2.35c

STANDARD STEEL CHAIN

Chain, ⅜ inch proof coil	5.00c

COLD ROLLED STRIP STEEL

Base price $5.25 to $6.00 per 100 pounds, hard, coils 1½ inches and wider and by .100 inches and heavier.

Extras.

.10 to .19 carbon. 1½ inches and wider. Coils.

	Hard.	Soft.
0.100 and heavier	Base	$0.25
0.050 to 0.099	$0.05	0.30
0.035 to 0.049	0.20	0.45
0.031 to 0.034	0.35	0.75
0.025 to 0.030	0.45	0.85
0.020 to 0.024	0.55	0.95
0.017 to 0.019	1.35	1.35
0.015 to 0.016	1.75	1.75
0.013 to 0.014	2.45	2.45
0.012	2.80	2.80
0.011	3.15	3.15
0.010	3.50	3.50

Lengths 24 Inches and Over.

	Hard.	Soft.
0.100 and heavier	$0.10	$0.35
0.050 to 0.099	0.20	0.45
0.035 to 0.049	0.35	0.60
0.031 to 0.034	0.60	1.00
0.025 to 0.030	0.85	1.25
0.020 to 0.024	1.05	1.45
0.017 to 0.019	2.45	2.45
0.015 to 0.016	2.85	2.85
0.013 to 0.014	3.70	3.70
0.012	4.30	4.30
0.011	4.65	4.65
0.010	5.00	5.00

Extras as per card of Jan. 1, 1916.

CAST IRON WATER PIPE

Four-inch, Chicago	$32.50 to 33.00
Six-inch and larger, Chicago	29.50 to 30.00
Six-inch Class B, New York	29.50
Four-inch, Class B, New York	32.50
Four to six-inch, Birmingham	28.00
Six-inch and larger, Birmingham	25.00

Light weight water and gas pipe, $1 per ton higher than standard water.

WAREHOUSE PRICES

Steel bars, Chicago	2.90c
Steel squares, 2-in. & ov., Cleve.	3.75c
Steel rounds, 2-in. & ov., Cleve.	3.75c
Steel bars, under 2 in., Cleveland	3.25c
Steel bars, Philadelphia	2.85c
Steel bars, New York	2.95c
Steel bars, St. Louis	2.95c
Steel bars, Cincinnati	3.00c to 3.50c
Steel bars, St. Paul	3.00c
Steel bars, over 2-inch, Buffalo	3.65c
Steel bars, Buffalo	2.95c
Iron bars, Chicago	2.30c
Iron bars, Cleveland	3.20c
Iron bars, St. Louis	2.75c
Iron bars, Cincinnati	3.00c to 3.50c
Iron bars, Philadelphia	2.85c to 3.00c
Iron bars, New York	2.95c
Shapes, Chgo.	2.90c
Shapes, St. Louis	2.95c
Shapes, St. Paul	3.00c
Shapes, New York	2.95c
Shapes, Cleveland	3.25c
Shapes, Philadelphia	2.85c
Shapes, Buffalo	2.95c
Shapes and plates, Cincinnati	3.00c to 3.15c
Plates, Chgo.	3.15c
Plates, St. Louis	3.20c
Plates, St. Paul	3.25c
Plates, New York	3.50c
Plates, Cleveland	3.65c
Plates, Philadelphia	3.50c
No. 10 blue anl. sheets, Chgo.	3.10c
No. 10 blue anl. sheets, Clevel'd	3.50c
No. 10 blue anl. sheets, Buffalo	3.25c
No. 10 blue anl. sh'ts, St. Louis	3.00c
No. 10 blue anl. sheets, Cinci.	3.25c to 3.50c
No. 10 blue anl. sheets, St. Paul	3.05c
No. 28 black sheets, Chgo.	3.10c
No. 28 black sheets, Cleveland	2.95c
No. 28 black sheets, Cincinnati	3.65c
No. 28 black sheets, St. Louis	3.20c
No. 28 black sheets, St. Paul	3.25c
No. 28 galv. sheets, Chgo.	4.80c to 5.00c
No. 28 galv. sheets, Cleveland	5.25c
No. 28 galv. sheets, Cincinnati	5.30c
No. 28 galvanized sheets, St. L.	5.25c to 5.50c

Freight Rates, Coke

Connellsville district, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.85
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

Arch bars and transoms, Chgo.	$18.00 to 18.50
Angle bars, iron, Chicago	17.25 to 17.75
Angle bars, steel, St. Louis	14.00 to 14.50
Arch bars and transoms, Chgo.	19.00 to 19.50
Arch bars and transoms, St. L.	18.50 to 19.00
Cut forge, Chicago	15.00 to 15.25
Knuckles, coup., Chgo.	16.00 to 16.25
Springs, St. Louis	15.50 to 16.00
Springs, Chgo.	16.25 to 16.50
Knuckles, coup., St. L.	15.50 to 16.00
Locomotive tires, Chicago	17.00 to 17.50
Locomotive tires, St. Louis	17.00 to 17.50
Railroad wrought, No. 1, Chgo.	16.25 to 16.75
Railroad wrought, No. 1, Cleve.	18.00 to 18.50
Railroad wrought, No. 1, St. L.	15.50 to 16.00
Railroad wrought, No. 1, Cinci.	13.00 to 13.50
Railroad wrought, No. 2, Chgo.	15.00 to 15.25
Railroad wrought, No. 2, St. L.	15.00 to 15.50
Shafting, St. Louis	18.00 to 18.50
Steel car axles, Birmingham	14.50
Steel car axles, St. Louis	21.00 to 22.00
Steel car axles, Chicago	22.25 to 22.75

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast (all rail)	73.9 cents
Pacific coast (tin plate)	70 cents
Pacific coast, via Panama canal	61.9 cents

Boiler plate, cut, No. 1, Chgo.	11.50 to 12.00
Boiler plate, cut, No. 1, St. L.	9.50 to 10.00
Boiler punchings, Chicago	14.00 to 14.50
Busheling, No. 1, Chicago	13.00 to 13.50
Busheling, No. 1, Cleveland	14.00 to 14.50
Busheling, No. 1, Cincinnati	10.50 to 11.00
Busheling, No. 1, St. Louis	11.50 to 12.00
Busheling, No. 2, Chicago	9.25 to 9.75
Bundled sheet, Cincinnati	8.50 to 9.00
Cast, No. 1, Cleveland	13.75 to 14.25
Cast, No. 1, Cincinnati	11.50 to 12.00
Cast, No. 1, St. Louis	13.00 to 13.50
Cast No. 1, Chicago	13.00 to 13.50
Cast borings, Chicago	7.50 to 8.00
Cast borings, Cleveland	8.50 to 8.75
Cast borings, Cincinnati	7.50 to 8.00
Cast borings, St. Louis	7.00 to 7.50
Machine shop turnings, Chgo.	8.00 to 8.50
Machine shop turnings, Clevel'd.	7.25 to 7.50
Machine shop turnings, Cinci.	7.00 to 7.50
Machine shop turnings, St. L.	7.50 to 8.00
Malleable agricultural, Chgo.	12.00 to 12.50
Malleable agricultural, St. Louis	12.50 to 13.00
Malleable railroad, Chicago	13.50 to 14.00
Malleable, Cincinnati	8.50 to 9.00
Malleable railroad, St. Louis	12.50 to 13.00
Pipes and flues, Cleve'd (nom.)	13.00 to 13.75
Pipes and flues, Chicago	11.75 to 12.25
Pipes and flues, St. Louis	10.50 to 11.00
Stove plate, Chicago	11.00 to 11.50
Stove plate, Cleveland	10.25 to 10.75
Stove plate, Buffalo	11.00 to 11.50
Stove plate, Cincinnati	8.25 to 8.75
Stove plate, St. Louis	10.00 to 10.50

(Gross tons.)

Boiler plate sheared, Buffalo	13.00 to 13.50
Busheling, No. 1, Buffalo	13.50 to 14.00
Busheling, No. 1, Pbgh	15.00 to 15.50
Busheling, No. 2, Buffalo	11.00 to 11.50
Bundled sheet, Pittsburgh	14.50 to 15.00
Bundled sheet, Cleveland	12.75 to 13.25
Bundeld sheet, Buffalo	12.00 to 12.50
Car wheels (iron), Pittsburgh	15.00 to 15.50
Car wheels (steel), Pittsburgh	18.00 to 18.50
Car wheels, Chicago	14.00 to 14.25
Car wheels, eastern Pa.	16.00 to 16.50
Car wheels, Buffalo	15.25 to 15.75
Car wheels, N. Y.	14.00 to 14.50
Car wheels, St. Louis	13.50 to 14.00
Cast borings, New York	8.50 to 8.75
Cast borings, eastern Pa.	11.00 to 11.50
Cast borings, Buffalo	9.25 to 9.75
Cast borings, Pittsburgh	11.25 to 11.50
Cast, No. 1, eastern Pa.	17.50 to 18.00
Cast, No. 1, Pittsburgh	16.00 to 16.50
Cast, heavy No. 1, N. J. points	17.00 to 17.50
Forge No. 1, eastern Pa.	14.50 to 15.00
Frogs, switches, guards, Chgo.	16.50 to 17.00
Frogs, switches, guards, St. L.	15.75 to 16.25
Grate bars, Buffalo	11.00 to 11.50
Grate bars, N. J. points	13.25 to 13.50
Heavy axle turnings, Buffalo	12.00 to 12.50
Heavy melting steel, Pbgh.	18.25 to 18.50
Heavy melting steel, Buffalo	16.50 to 17.00
Heavy melting steel, Chicago	16.50 to 17.00
Heavy melting steel, Cleveland	16.25 to 16.75
Heavy melting steel, Cincinnati	14.00 to 14.50
Heavy melting steel, eastern Pa.	17.00 to 17.50
Heavy melting steel, New York	14.50 to 15.00
Heavy melting steel, St. Louis	16.00 to 16.50
Iron rails, Chicago	18.00 to 18.50
Iron rails, Buffalo	17.00 to 17.50
Iron rails, Cincinnati	14.25 to 14.75
Iron rails, St. Louis	17.00 to 17.50
Iron rails, Cleveland (nom.)	17.00 to 18.00
Iron axles, Pittsburgh	25.00 to 26.00
Iron axles, Cincinnati	20.50 to 21.00
Iron axles, eastern Pa.	26.00 to 27.00
Iron axles, Chgo.	23.50 to 24.00
Iron axles, St. Louis	20.00 to 21.00
Iron axles, Buffalo	23.00 to 23.50
Low phos. steel, Buffalo	20.50 to 21.00
Low phosphorus steel, Pbgh.	21.50
Low phos. steel, eastern Pa.	22.00 to 23.00
Machine shop turnings, Buffalo	7.75 to 8.25
Mch. shop turnings, New York	7.75 to 8.00
Mch. shop turnings, Pbgh.	9.50 to 10.00
Mch. shop turnings, eastern Pa.	10.00 to 10.50
Mall. railroad, Cleveland	16.25 to 16.50
Malleable railroad, Pittsburgh	16.25 to 16.50
Malleable railroad, Buffalo	15.25 to 15.75
Malleable railroad, eastern Pa.	14.50 to 15.00
R. R. and mch. cast, No. 1 Bfl.	15.50 to 16.00
R. R. wrought, No. 1, Buffalo	17.50 to 18.00
Railroad wrought, No. 1, E. Pa.	21.00 to 22.00
R. R. wrgt., No. 1, New York	19.00 to 19.50
Railroad wrought, No. 1, Pbgh.	19.00 to 19.50
Reroll. rails, 5 ft. & ov., Pbgh.	18.25 to 18.50
Reroll. rails, 5 ft. & ov., Chgo.	17.75 to 18.25
Reroll. rails, 5 ft. & ov., Cleve.	16.25 to 16.75
Reroll. rails, 5 ft. & ov., E. Pa.	19.00 to 20.00
Reroll. rails, 5 ft. & ov., St. L.	17.50 to 18.00
Shafting, New York	19.00 to 19.50
Shafting, eastern Pa.	22.00 to 22.50
Shoveling steel, Chicago	16.25 to 16.75
Shoveling steel, St. Louis	14.00 to 14.50
Steel rails, short, Chicago	17.00 to 17.50
Steel rails, short, Cleveland	18.25 to 18.50
Steel rails, short, St. Louis	16.00 to 16.50
Steel car axles, New York	22.00 to 23.00
Steel car axles, Buffalo	23.00 to 23.50
Steel car axles, Cleveland	24.00 to 24.50
Steel car axles, Pittsburgh	24.50 to 25.50
Steel car axles, eastern Pa.	24.00 to 25.00
Stove plate, N. J. points	13.25 to 13.50
Stove plate, Pittsburgh	12.00 to 12.25
Stove plate, eastern Pa.	13.75 to 14.25
Wrought pipe, New York	13.00 to 13.25
Wrought pipe, eastern Pa.	14.75 to 15.25

Opportunities

POSITIONS OFFERED

Minimum ad. set solid, 50 words $1.00
Minimum ad. all caps, 50 words $1.50

POSITIONS WANTED

Minimum ad. set sold, 25 words $.50
Minimum ad. all caps, 25 words $.75

(Each additional word set solid, 2c.—Each additional word all caps, 3c.)

Positions Offered

WANTED AT ONCE, SEVERAL FIRST class draftsmen of general mill and blast furnace experience. State age, experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 749, THE IRON TRADE REVIEW, Cleveland, O.

WANTED AT ONCE, SEVERAL DRAFTSMEN experienced in power plant and general piping work. State experience, present salary and salary wanted in first letter; also when available. Central location Pittsburgh. Address Box 750, THE IRON TRADE REVIEW, Cleveland, O.

UNDERSIGNED COUNSEL WILL CONFIDENTIALLY negotiate preliminaries for important executive, technical, administrative and professional positions, insuring strictest privacy. Not an agency, but a highly-endorsed, high grade method of negotiating preliminaries only, for $2,000 to $12,000 men. Send address only for explanation. R. W. Bixby, F1 Niagara Square, Buffalo, N. Y.

WANTED: — COMPETENT AND EXPERIENCED Superintendent (Gentile) for Iron Yard in St. Louis, Mo. State experience, references and salary desired. Address Box 796 THE IRON TRADE REVIEW, Chicago, Ill.

THE BEST WAY TO GET A GOOD position in drafting or engineering is to file an application direct with some of our clients who are depending on us to get competent and experienced applicants for their vacant positions. Send stamp for blank and list of vacant positions. The Cleveland Engineering Agency Co., Rose building, Cleveland, O.

WANTED:—GENERAL FOREMAN FOR Machine Shop employing about 250 men. Must have experience in heavy and light work of miscellaneous character, must also be able to estimate accurately labor on work. Should be a good organizer and able to produce results. Shop located in Northern Ohio. State age, salary and experience; also references and where last employed. Address Box 797, THE IRON TRADE REVIEW, Cleveland, O.

SHOP SUPERINTENDENT WANTED BY ORDNANCE PLANT. Must be conversant with modern methods and equipment; also capable of operating under forced draft. Give full particulars as to experience, previous employment, age and salary expected. Applications will be treated in confidence. Address Manager, Box 176, Newark, N. J.

WANTED — ASS'T. SUPERINTENDENT for steel foundry making small high-grade steel castings in middle west. Must be a hustler and well recommended. Give age, experience and wages expected. Address Box 811, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—SALESMEN CALLING ON laboratories to communicate with view of taking on gas machines and burners as side line. All correspondence will be considered confidential. Address Tirrill Gas Machine Lighting Co., 103 Park Ave., New York, N. Y.

CHEMISTS WANTED BY A LARGE steel manufacturer, must be experienced in analysis of iron, steel, ores, limestones, slags, etc. Apply stating age, training, experience and salary expected. Address Box 824, THE IRON TRADE REVIEW, Cleveland, O.

STRUCTURAL DRAFTSMEN; MEN WHO have had some experience in detailing steel and iron work for buildings, highway bridges, boilers, tanks, etc. Several positions open and special inducements to competent men. Particulars will be furnished free by THE ENGINEERING AGENCY, INC. Established twenty-four years, 1662 Monadnock Bldg., Chicago, Ill.

Positions Offered

WANTED:—BY A LARGE MALLEABLE iron foundry in the East an experienced Metallurgist, one who can efficiently superintend Laboratory and do research work. State age, experience and salary expected. Address Box 815, THE IRON TRADE REVIEW, Cleveland, O.

WANTED:—MECHANICAL ENGINEER with experience of general steel plant work and a special knowledge and experience of open hearth and heating furnaces, and competent to take charge of work of designing and estimating on furnaces. State salary wanted. Address Box 821, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — EXPERIENCED BLOWER for side blow converters for cast steel. Must be a man willing to hustle. State age, experience, wages. Address Box 818, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — SUPERINTENDENT FOR machine department of forging Company in Pennsylvania. Must be capable of increasing production. Good salary to right man. Address Box 825, THE IRON TRADE REVIEW, Cleveland, O.

WANTED: — CHIEF DRAUGHTSMAN, and draughtsmen, familiar with by-product coke, blast furnace, open hearth, rolling mill and wire mill designs. Give experience fully. Address Box 826, THE IRON TRADE REVIEW, Cleveland, O.

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BLAST FURNACE SUPERINTENDENT, competent, successful and up-to-date in furnace practice. For 10 years making Bessemer iron. Now employed at a record breaking plant making basic iron. Wishes position with a company appreciating good work. Can refer you to past and present employer. Address Box 755, THE IRON TRADE REVIEW, Cleveland, O.

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Monday

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Positions Wanted

ORNAMENTAL IRON AND STRUCTUral steel man; desires connection with iron or steel works, graduate civil and mechanical engineer. Can take financial interest and devote all my time to the business. Experienced in selling and contracting for building products, bridges and reinforcing steel, competent designer and estimator. Address Box 742, THE IRON TRADE REVIEW, Cleveland, O.

FOREMAN NOW EMPLOYED, WISHES to make change; have 20 years' experience as pattern maker and foreman, draftsman and designer; last four years in charge of designing, experimental and pattern departments with a large brass firm. Thoroughly up to date on modern shop practice. Address Box 707, THE IRON TRADE REVIEW, Cleveland, O.

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AS BLAST FURNACE SUPERINTENDent or assistant; 16 years experience in making special irons. Am an expert on Ferro Manganese, Spiegel and Silico Spiegel. Address Box 814, THE IRON TRADE REVIEW, Cleveland, O.

POSITION WANTED:—OFFICE MAN; 15 years experience, general office, management, accounting, purchasing, traffic and sales department; desires position where hard work and practical experience is required. Address Box 819, THE IRON TRADE REVIEW, Cleveland, O.

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GENERAL SUPERINTENDENT OR assistant to Chief Executive; college graduate, 13 years exceptional experience covering O. H. furnaces, blooming, billet, bar and sheet mills. At present assistant general superintendent, large independent plant, desires change to broader opportunity. Investigate my record. Address Box 835, THE IRON TRADE REVIEW, Cleveland, O.

GENERAL OFFICE OR SALES POSItion with ore company by technical man, familiar with blast furnace operations. Address Box 836, THE IRON TRADE REVIEW, Cleveland, O.